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FOR THE

PROMOTION OF THE MECHANIC ARTS.

MAY, 1848.

CIVIL ENGINEERING.

Annual Report of the Board of Canal Commisioners, for the fiscal year ending November 30, 1837.

(Continued from page 226.)

The Board respectfully refer to the accompanying report of the superintendent of motive power, for a more detailed statement of the operations of the road.

The main line of canal was opened for navigation, on the 11th of March, and continued in operation, with but few slight interruptions, until the occurrence of the flood of the 7th of October.

The Eastern division sustained very little injury from the floods.—Conewago and Stony Creek aqueducts received new superstructures, and were widened. The other necessary repairs mentioned in the last estimates, were all made during the year. The re-building of Clark's Ferry bridge has been completed, at a cost of thirty-six thousand and ninety-eight dollars and fifty seven cents, being eight hundred and seventy-four dollars and eighty-two cents less than the estimate.

The Juniata division suffered more severely from the flood than any other portion of the lines of canal. The river rose thirty-three feet at some points, inundating the canal, washing away the banks, and destroying or materially injuring many of the mechanical structures.—Several heavy breaches occurred between the Junction and Millerstown dam. The dam and guard lock were injured, and the sheeves

of the rope ferry carried away. From this point to Lewistown the greatest damage received was the destruction of the Thompsontown aqueduct, and the washing away of the towing path, and the filling up of the bottom of the canal, between Mexico and the head of the Long Narrows. From Lewistown to Aughwick dam, the damage was confined to a few breaches in the banks. From Aughwick dam to the head of the line at Hollidaysburg, the greatest injury was sustained. The dams, with one or two exceptions, were more or less damaged; several locks were swept off, and others injured; the aqueducts were either carried away, or so much shattered as to require rebuilding or extensive repairs; and the banks of the canal for miles washed away, and the bottom filled up with the deposit left by the receding waters.

The navigation of the upper portion of the division was, as a matter of necessity, closed for the remainder of the season. But as it was practicable to place the lower part of the line in order before the close of navigation, and as it was known that a large amount of tonnage was detained by the breaches from reaching its destination, or waiting their repair to reach a market, it was considered a matter of convenience to the business community, and of public economy, to commence the repairs without delay. A large force was consequently placed on the division between the Junction and Newton Hamilton. The work was prosecuted with vigor, and the repairs so far completed, as to permit the resumption of navigation between these points on the 18th of November, after a suspension of forty days. On the 24th of November the line was visited by another flood, which caused a few breaches, and some injury to the structures under repair, and detained the navigation for three days. This was succeeded by a third flood, on the 12th day of the present month, which did considerable damage to the line, and caused the entire suspension of navigation.

The total estimated cost of the damage to the whole division by these floods is two hundred and twenty-two thousand five hundred and thirty-five dollars and sixty-one cents.

All the necessary arrangements have been made by the officers on this division to complete the repairs by the middle of February, so as to insure the opening of the entire main line at the earliest period at which the weather will permit in the spring. There can be no doubt of the accomplishment of an object so essential to advance the public interests, if the Legislature make a partial appropriation for repairs at any early day of its session, in advance of the general appropriation bill. The work can be done in time, if the funds be provided at the proper season.

A large item of repair expense might be annually saved by substituting slackwater for the present navigation through the Long Narrows, below Lewistown. A dam at the head of these narrows feeds the level which passes through the contracted gorge of the mountain. In times of flood, the waters become compressed at this point, overflow the canal banks, and almost invariably do great damage to the protection wall, the towing path, and the bed of the canal.

This drain upon the repair fund, and the frequent detention at this point, could be obviated by the construction of a dam at the lower end of the narrows, thus forming a slackwater backing up to the dam above. This improvement could be completed at a cost not exceeding the expense incurred within a few years past for the repairs of the piece of canal which would be thus abandoned. It would be economical, and afford a better line of transportation. The propriety of making the change is worthy the consideration of the Legislature. Should that body at its coming or any succeeding session, concur in the suggestions of the Board, an estimate of the cost will be laid before it.

Upon the Western division, the navigation has experienced but little interruption during the season. The lower portion of the line escaped damage by the flood of October. On the upper portion, dam No. 5. and the dam at the head of the basin at Johnstown, received considerable damage, and several breaches occurred in the banks of the canal. The repairs were, however, so far advanced as to permit of the resumption of navigation after a suspension of one week. The principal extraordinary repairs which will be required on this line during the present winter, are, the replacing of the superstructure of the Pine Creek aqueduct; repairs to the aqueduct over the Allegheny, near Freeport; the repairing of water ways, slope wall, &c.

The net revenue from the main line of canal, was two hundred and forty five thousand nine hundred and thirty-three dollars and forty-eight cents. Total net revenue on whole main line of canal and railroad, six hundred and twenty thousand seven hundred and fifty dollars and sixteen cents.

The navigation on the Susquehanna division was opened on the 12th of March. This line did not escape the effects of the flood of October. A heavy breach occurred at the Junction, at the head of Duncan's island; and another at the upper end of the culvert over Wild Cat creek, below Liverpool. The requisite repairs were made as soon as practicable, and the navigation re-opened after a suspension of about three weeks. As the spans of the culvert over Wild Cat creek are too contracted to discharge the waters in extraordinary freshets, and as the structure requires extensive repairs, if not re-building, it has been determined to substitute an aqueduct for the culvert. This will be done during the present winter, at an expense not much exceeding the repair of the culvert, and at the same time effecting a desirable improvement in the line. The aqueduct over Penn's creek, the locks, water-ways, &c., will require some repairs. Cost of damage by floods, six thousand nine hundred and four dollar.

The winter repairs upon the West Branch division were completed, and the navigation opened, on the 18th of March, and remained uninterrupted until the 25th of September, when a rise in Delaware run caused the waters to break into the canal, making three large breaches in the level. This was succeeded by the flood of the 7th and 8th of October, which made numerous breaches in the canal, washed away the banks in various places, partially displacing and damaging the aqueducts over Larry's and Lycoming creeks. The dam at

Queen's run was injured, and the water broke in around the Muncy dam, on the west side, and washed the bank away for about three hundred feet, and taking out some two acres of land. The structures were temporarily repaired, and the banks of the canal placed in a condition to pass boats; but on the 12th of this month another flood occurred, which made several breaches on the line, and closed the navigation for the season. Estimated cost of repairing the damage by both floods, nineteen thousand dollars. To place this line in order for the spring business, it is requisite that an early appropriation should be made by the Legislature.

The repairs to the mechanical work, and the banks and bed of the North Branch division, delayed the opening of navigation until the 10th of April. As the line received no injury from the floods, the transportation upon it was uninterrupted until the close of the season, with the exception of seven days, caused by the giving way of a culvert and the high water in the river. The repairs to Nanticoke dam are not quite completed. About ninety feet of cribbing and filling are required to make it secure. The shute of the dam is in bad condition, and will require considerable repair.

Total estimated cost of repairing damage by floods on all the lines, two hundred and sixty-five thousand nine hundred and thirty-nine dollars and sixty-one cents.

In pursuance of the act of the 16th of March, 1847, authorizing the construction of a weigh-lock on the North Branch division, the Board, after an examination of several sites, located the lock at Beach Haven, on the lower end of the first level below Nanticoke dam. This location, in addition to its other advantages, avoids the necessity of wasting water when weighing boats, as the water from the lock will be discharged through a culvert into the level below. Proposals were issued for the construction of the lock, and the work allotted to Pettibone and Marcy, who are progressing with the work, and will have it completed by the opening of navigation. It will be a composite lock, ninety-two feet long in the chamber, and seventeen feet wide in the clear. A contract was also entered into with Messrs. Ellicott and Abbott of Philadelphia, for scales of an improved construction. They have been partly delivered, and will be put up as soon as the lock is completed.

The toll received on the Susquehanna and North and West Branch divisions, in 1847, was one hundred and eighty-five thousand eight hundred and thirty-nine dollars and seventy-four cents, being an excess of thirty-three thousand seven hundred and four dollars and fifty-two cents over 1846.

The Delaware division has been in successful operation from the opening of navigation, on the 13th of March, to the close of the season, having experienced but a few slight interruptions throughout the year. The repairs for the year were of the usual ordinary character, and were executed in an economical manner. A reference to the table of receipts and expenditures will show that there has been a gratifying increase of business on this valuable portion of the public improvements over the last year. The excess of receipts over expen-

ditures in 1847, amount to one hundred and forty-eight thousand eighty-two dollars and sixty-seven cents, making a large interest on one million three hundred and eighty-four thousand one hundred and thirty-six dollars and ninety-six cents, the original cost of construction.

Under the provisions of the act of the 20th of April, 1846, entitled "An act authorizing the construction of an out-let lock on the Delaware division, Pennsylvania canal," the Board, on the 26th of April last, advertised for proposals for a loan of twenty thousand dollars, for the construction of the lock at Wells' falls, to be re-imbursed in the manner prescribed by the act. The loan was taken by C. Macalister, at an interest of five per cent., and deposited in the State Treasury on the 11th of June last. A certificate was issued to Mr. Macalister, by the Board of Canal Commissioners, in accordance with the provisions of the act of the Legislature. Proposals were immediately issued for the construction of the work, which was allotted to the lowest bidders, Sumner and Delano, at the gross sum of eighteen thousand dollars. The work was commenced forthwith, and is now nearly completed, and only awaits the discharge of water from the canal, in order to sever the intermediate portion, and form the proper connexion with the canal prism. This improvement consists of a guard-lock one hundred and twenty-two feet in the chamber, a canal nine hundred feet in length, and an out-let lock two and a-half feet lift, with chamber one-hundred and twenty-two feet in the clear. The locks are built of ruble masonry, laid in the best hydraulic cement. The towing path is paved one foot thick on top, thoroughly walled both outside and in, and altogether is believed to form a complete and durable work. A connexion will thus be formed with the Delaware and Raritan canal, without any diminution of the revenues of the line, the act prescribing that boats passing in or out at the lock, shall pay tolls for the whole distance between Easton and Bristol.

The Eastern reservoir, designed to supply the upper levels of the Juniata division, during the dry season, has been completed, and was put in operation during the season just closed. It is believed it will fully answer all the purposes of its construction. The actual cost of its construction was $32,566·17; amount appropriated, thirty thousand dollars, leaving a balance of $2,566·17 to be provided for.

In their last annual report the Board stated that "the large expenditures required for repairing the damage, by the last spring's flood, to our public works, induced the Board to defer placing the work at the Western reservoir under contract at the time they had intended, and no measures other than receiving proposals for it, have been taken for its prosecution." The utility of such a feeder to the Western division has been practically demonstrated during the short period the reservoir on the eastern side of the mountain has been in operation. But as it is doubtful whether the appropriation made to complete this work, by the act of the 31st of January, 1846, has, or has not, reverted to the general funds of the Treasury, it remains for the Legislature to determine whether it shall be completed and brought into use.

Petitions from all sections of the Commonwealth, numerously and

respectably signed, have, at different times, been presented to the Board, praying that the public works may be closed on the Sabbath day. After having given to these petitions that consideration which was due to the character and the object of the memorialists, the Board came to the conclusion that they had no jurisdiction over the matter. They therefore, respectfully refer the subject to the Legislature.

All the claims for damages under general or special acts, in which sufficient testimony has been produced, have been acted on; and the awards, where damages have been allowed, will be found in statement No. 3. excepting in those cases requiring special reports, which will be made at an early day of the session. The general appropriation bill of the last session enacts that "no awards made under general or special laws previous to the 1st of January, 1847, shall be paid until a special appropriation shall be made therefor." Several demands have been made for the payment of awards reported to the Legislature previous to the last session, which could not be complied with, owing to the restrictions of this act. It would seem to be due to these claimants that some general provision should be made for their relief.

The act of the 16th of March, 1847, to provide for the ordinary expenses of government, &c., appropriated the sum of ten thousand dollars for re-building public and farm bridges over the canals and railroads. Of this amount, four thousand two hundred and twenty-five dollars have been drawn from the Treasury, leaving a balance of five thousand seven hundred and seventy-five dollars, which will be applied to the repair of bridges during the present season.

The estimated cost for repairs in 1848, is exhibited in the accompanying statement, No. 2. The amount therein asked for, of two hundred and thirty-three thousand three hundred and sixty dollars, for ordinary and extraordinary repairs, and two hundred and four thousand five hundred dollars for the repair of breaches by the late floods, will be amply sufficient for the purpose, should no similar disaster occur, provided the usual appropriation is made of fifty thousand dollars, for the purchase and preparation of materials for executing repairs after the 1st of December next.

The act of the 20th of April, 1846, appropriated fifty thousand dollars for the purchase and preparation of materials for repairs after the 1st of December, of that year. Of this sum, twenty-three thousand six hundred and ninety-four dollars and forty-seven cents were expended for those purposes previous to the 1st of December, 1846. In their last annual report, the Board remarked that "in the appropriation of April 20, 1846, the usual contingent fund for breaches, &c., was omitted; and a large amount of extraordinary repairs of this character have been made during the past season, rendered necessary by frequent floods, land slides, breaches, and other casualties. These causes have operated to exhaust the existing appropriations for repairs of the canal and railroads, and unless funds are immediately provided, the current repairs during the winter, cannot be as promptly and economically made as they ought to be. In consequence of

the expense of these extraordinary repairs in 1846, the balance of the before mentioned appropriation of fifty thousand dollars, amounting to twenty-six thousand five hundred and five dollars and fifty-three cents, was absorbed in the payment of debts due for repairs previous to the 1st of December, 1846, with the exception of six hundred and fifteen dollars and seventy-one cents, which was applied to the repairs of 1847. As the Legislature omitted to make an appropriation for breaches, at its last session, the Board were compelled to expend thirty-five thousand three hundred and forty-four dollars, of the fifty thousand dollars appropriated for materials and repairs after the 1st of December, 1847, in the repair of the damages by the several floods. This has necessarily left the different lines of canal and railroad in debt for ordinary repairs. No appropriation for the payment of these debts will be required if the amounts asked for in the estimates be granted.

As the funds appropriated by the Legislature were nearly exhausted soon after commencing the repair of the breaches by the flood of October, the Board found themselves under the necessity either of abandoning all further operations, which would have put it out of their power to place the canals in order for an early spring business, or of obtaining the means of prosecuting the repairs in advance of the meeting of the Legislature. To have suspended the repairs at that time would have been productive of certain loss to the revenues of the Commonwealth. In this emergency, the Board deemed it their duty to hold a conference with the Governor and State Treasurer, as to the proper course to be pursued. The result of that conference was a circular addressed by the Governor to several of the banks holding on deposit the State funds, asking them to place, on their own responsibility, the sum of fifty thousand dollars, in the aggregate, to the credit of the Treasurer of the Board of Canal Commissioners, to be applied exclusively to the repair of damages by the floods—trusting to the Legislature to replace the amount to their credit at an early day. The banks complied with the request, and the money, so far as drawn out, has been solely applied to the object contemplated. This sum of fifty thousand dollars is included in the estimates of the present year for the repair of breaches.

The Board would earnestly recommend to the Legislature the propriety of adopting some provision, under proper restrictions, for the repair of extraordinary breaches, when the specific appropriations have become exhausted. The disasters of the present year point to the necessity of adopting such measures, as, in similar cases, would advance the public interests, and at the same time, relieve the Board and other officers of the government from the assumption of an unpleasant responsibility.

It is hoped that the Legislature will perceive the necessity of making an early appropriation (in addition to the fifty thousand dollars received from the banks,) for repairs in advance of the passage of the general appropriation bill. If no such appropriation be made immediately, the public works cannot be opened for navigation at the proper period in the spring.

If no serious breaches should occur, it may be safely estimated that the receipts from the public works in 1848, will amount to one million seven hundred thousand dollars. The estimates of expenses in statement No. 2, and for expenses of motive power, amount to seven hundred and seventy-nine thousand five hundred and ninety dollars. If the estimate of receipts from tolls be realized, the net revenue, from the several lines of canal and railroad in 1848, will amount to nine hundred and twenty thousand four hundred and ten dollars.

J. HARTSHORNE,
JAMES BURNS,
J. M. POWER,
Canal Commissioners.

CANAL COMMISSIONERS' OFFICE,
Harrisburg, Dec. 30, 1847.

Extracts from the Thirteenth Annual Report of the Directors of the Western Rail-Road Corporation, to the Stockholders, January, 1848.

The Directors of the Western Railroad Corporation submit this, their Thirteenth Annual Report of the business of the Road, and their doings during the financial year, which terminated on the 30th day of November, 1847.

TRANSPORTATION DEPARTMENT.

The balance to the credit of the contingent fund, at the commencement of the year, was			$104,011·99
The income of the Road during the year has been:—			
From Passengers,	$502,321·92		
" Freight,	785,345·66		
" Mails, Rents, &c.,	37,668·48	=$1,325,336·06	
Expenses: —			
For road repairs,	$196,548·63		
" Engine repairs,	52,050·12		
" Car repairs,	72,061·03		
" Buildings, &c.,	34,630·86		
" Transportation expenses,	280,623·35		
" General expenses,	40,775·76	= 676,689·75	
Nett earnings,		$648,646·31	
From which deduct interest paid on loan,	$264,854·53		
One dividend of four per cent. on 35,500 shares,	$142,000		
One do. on 40,000 do.	160,000	=302,000·00	= 566,854·53
Leaving a surplus for the year of			$81,791·78
And a total surplus, Nov. 30, 1847,			$185,803·77

During the year, the passenger trains have run regularly and without any serious accident. No passenger has been injured. The freight trains have been less fortunate. Several accidents have occurred to these trains, whereby several brakemen have lost their lives, and a number have been badly injured. Two of the men employed upon the road have lost their lives within the past year by coming in contact with the bridges over the track. In previous years there has been

a larger loss of life from this cause. The attention of the directors has been called to the adoption of measures to prevent this class of accidents, and they consider it very desirable that every bridge over the track by which brakemen are exposed to accident should be raised to a sufficient height; which they hope to accomplish, if the consent of the proper authorities can be obtained, and if the work can be accomplished at a reasonable expense.

The increase of business for the past year, as compared with the previous year, has been fifty-seven per cent. on freight, and twenty-one per cent. on passengers, making an average gain of forty-two per cent on the gross receipts.

The annexed tables exhibit as follows:—

A.

The amount received from all sources since the Road was opened.

	Passengers.	Merchandize	Mails, &c.	Total.	Expenses.	Balance of Receipts.	Miles Run.
3 months in 1839	$13,472 94	$4,136 21		$17,609 15	$14,380 64	$3,228 51	
1840	70,820 79	38,359 78	$3,166 82	112,347 39	62,071 72	50,275 67	94,404
1841	113,841 85	64,467 14	4,000 00	182,308 99	132,501 45	49,807 54	160,106
*1842	266,446 83	226,674 61	19,566 84	512,688 28	266,619 30	246,068 98	397,295
1843	275,139 64	275,696 19	23,046 68	573,882 51	303,973 06	269,909 45	441,608½
1844	358,694 00	371,131 84	23,926 88	753,752 72	314,074 20	439,678 52	499,968
1845	366,753 02	420,717 30	26,009 83	813,480 15	370,621 25	442,858 90	530,201
11 months in 1846	339,861 42	459,365 18	29,191 29	878,417 89	412,679 60	465,738 09	573,956
1847	502,321 92	785,345 66	37,668 48	1,325,336 06	676,689 75	648,646 31	819,010

* First year of opening through to Albany.

B.

Number of Through and Way Passengers.

	Through Passengers.			Way Passengers.					
	1st. Class.	2d Class.	Total.	1st Class.	2d Class.	Total.	Total 1st Class.	Total 2d Class.	Grand Total.
1842	15,890	2,680½	18,570½	148,500	23,366	171,866	164,390	26,046½	190,436½
1843	19,987	6,608	26,595	140,425	33,945½	174,370½	160,412	40,553½	200,965½
1844	17,016½	7,314	24,330½	140,868½	55,058½	195,927	157,885	62,372½	220,257½
1845	13,401½	5,791	19,192½	144,723	59,717½	204,440½	158,124½	65,508½	223,633
11 months in 1846	21,033	8,799½	29,832½	165,196	70,635½	235,831½	186,229	79,435	265,664
1847	23,678	10,621½	34,299½	264,444½	89,567	354,011½	288,122½	100,188½	388,311
	111,006	41,814½	152,820½	1,004,157	332,290	1,336,447	1,115,163	374,104½	1,489,267½

C. *Number of Tons Transported.*

	Going Westward.			Going Eastward.					
	Through from Boston to Albany	All other Tonnage.	Total going West	Through from Albany to Boston.	All other Tonnage.	Total going East	Total No. of Tons moved	Equivalent No. of Tons carried one mile.	Equivalent No. of Tons carried over the whole road.
11 months in 1846	8,358	40,251	48,609	36,403	81,382	117,785	166,394	15,748,223	100,950
1847	11,962	56,554	68,516	88,438	117,737	206,175	274,691	28,037,628	179,728

Miles run by Locomotive Engines.

	Passenger Trains.	Freight Trains.	Gravel Trains, &c.	Total No. of Miles run.
11 months in 1846	215,336	313,259	45,382	573,956
1847	236,677	513,772	68,961	819,010

F. *Table shewing the Cost of the Western, and Albany and West Stockbridge Railroads to Nov. 30, 1847.*

Heads of Expenditures.	Amount paid to Dec. 1, 1846.		Amount paid in 1847.		Total amount paid.		Total cost of both Roads.
	Western Railroad.	A. & W. S. Railroad.	Western Railroad.	A. & W. S. R. R.	Western Railroad.	A. & W. S. Railroad.	
Graduation and Masonry,	$3,154,039·86	$889,635·96	$95,736·90		$3,249,776·76	889,635·96	$4,324,455·43
Bridging,	163,736·23		21,306·48		185,042·71		
Superstructure, including Iron,	1,054,033·46	293,726·65	136,338·66		1,190,372·12	293,726·65	1,484,098·77
Station Buildings and Fixtures,	250,332·01	175,173·92	19,502·29	$1,414·24	269,834·30	176,588·16	446,424·46
Land, Land Damage, and Fencing,	277,006·16	204,022·99	9,002·55	6,100·00	286,008·71	210,122·99	496,131·70
Locomotives,	418,978·14		66,681·05		485,659·19		485,659·19
Passenger and Baggage Cars,	55,066·49		9,204·35		64,270·84		64,270·84
Merchandize Cars,	370,548·01		39,613·63		410,161·64		410,161·64
Engineering and other Expenses,	665,850·61	213,637·93	*175,256·73	3,528·47	841,107·34	217,166·40	1,058,273·74
	6,409,590·97	1,776,197·45	572,642·64	11,042·71	6,982,233·11	1,787,240·16	8,769,473·77

* This item seems to require explanation. Of the amount, $173,496 92 is charged to construction account, as if it were expended this year, although such is not the fact. Under various acts of the Legislature, £899,900 sterling scrip was issued, sold, and must be redeemed at maturity, at the rate of not less than $4·80 per pound sterling. The liability of the Corporation, on account of the bonds, must therefore be stated at that rate, exhibiting a total of $4,319,520 — Up to the present year this liability only appeared on the books of the Corporation, as estimated at the value recognized by the Legislature, $4·44 per pound sterling, and the balance to the credit of exchange account. The difference between the apparent and real liability $173,496 92 is now charged to construction, it being, in fact, the difference between what was realized from construction funds, and what the Corporation must eventually pay.

Extracts from the Annual Report of the Board of Directors of the South Carolina Railroad Company, for the year 1847.

Charleston, S. C., 8th Feb., 1848.

The Board of Directors of the South Carolina Railroad Company regret that they are not able to present as favorable a statement of the operations for 1847 as the business transactions for the first six months of the year, confidently encouraged.

In October last, a revulsion in the commercial relations between the United States and Great Britain, swept like a tornado over the land, paralyzing all the monied interchanges between our cities, and extending to the Agricultural interests in the interior. Cotton, the great staple of the South, declined 5 cents per lb. in value, and this with other connecting causes, suspended for a while all the transportation of produce, excepting such as was in transitu, and on which the railroad mostly relied at that season for revenue.

The effects of this derangement in trade, cannot be more strongly presented than by the fact, that the freight lists exhibit 62,833 bales of cotton less than for the corresponding months of October, November, and December of the present year, and $49,452·88 reduction in the monied receipts for the same period, which clearly shows that all of the deficiency was in down freights, while the up freight and passage, had been reserved, but not to the augmented extent estimated, and on which, from more enlarged connexions West, confidence had justly been reposed.

Notwithstanding these sudden and unlooked for events, the gross receipts for the year amount to - - - $655,575·30
The current expenses to - - - 303,480·40

And the nett revenue to - - - 352,094·90
(Being a fraction less than the ratio of 47 per cent. of expenditures to receipts.)
From this revenue, provision has been made for meeting annual interest on Foreign debt, 108,461·77
And payment of July dividend, 93,143·75
201,605·52

Leaving in reserve, - - - 150,489·38

Applicable to meet in part, obligations contracted in the construction of the Camden Branch, and to permanent improvements on the Track, at Depots, at Workshops, and for increased Locomotive and Car Power. These statements show an increase in the annual receipts, notwithstanding the deficiencies in the three last, and usually most busy months, of $66,494·05, and an increase in the net revenue of $72,722·78 over the previous year of 1846.

Statement No. 3.

Gross Revenue from all sources,			$655,575·30
Total Expenditures—in Road Machinery and Transportation Departments and Contingencies,		$397,604·99	
Deduct permanent expenditures, viz:			
For Camden Branch,	$9,407·69		
" Additional Machinery in Workshops,	880·00		
" Cost of additional Box, Platform, and Baggage Cars,	56,334·00		
" Cost of materials and Machinery on hand applicable for new Cars, &c., ordered,	27,503·00		
		94,124·59	
Current expenses,			303,480·40
Net Revenue for the year,			352,094·90
Paid July Dividend,		$93,143·75	
Interest on Sterling Bonds,		108,461·77	
			201,605·52
Leaving, applicable to the permanent objects of: to-wit, Improvements of Depots, purchase of Lands, new Locomotives and Rail Iron: a balance of			$150,489·38
The net income $352,094·90: being on the cost of the Hamburg Road; and the Stock represented in the Company, more than 6¼ per cent. for the year 1847.			
Cost of Hamburg Road,		$2,786,081·99	
Amount due State, to be vested in Bonds,		178,223·66	
		$2,964,315·65	
Stock represented in Company by 34,800 Shares at $75,		2,610,000·00	
Total original cost of Property of Road,		$5,574,315·65	

THOMAS WARING, *Auditor.*

No. 4.

No. 4.

Statement of the number of Passengers conveyed upon the Railroad between Charleston, Hamburg, and Columbia, with the amount received for Freight and Passage, &c., during the year 1847.

1847.	PASSAGE. UP.		DOWN.		UP AND DOWN.		FREIGHT. UP.	DOWN.	UP AND DOWN.	TOTAL AMOUNT
	No. Pass.	Amount. Passage.	No. Pass.	Amount. Passage.	No. Pass.	Amount. Passage.	Amount. Freight.	Amount. Freight.	Amount. Freight.	Freight and Passage.
January,	3,136	9,237·88	2,390	7,603·97	5,526	16,841·85	14,922·84	30,731·19	45,654·03	62,495·88
February,	2,874	8,657·90	2,308	8,506·75	5,182	17,164·65	15,046·32	24,941·20	39,987·52	57,152·17
March,	4,615	17,396·71	2,320	8,812·04	6,935	26,208·75	25,172·85	17,221·43	42,394·28	68,603·03
April,	9,581	10,896·71	8,409	10,137·80	17,990	21,034·51	22,005·74	17,925·70	39,931·44	60,965·95
May,	2,919	8,772·34	2,425	7,383·36	5,344	16,155·70	12,779·66	13,130·48	25,910·14	42,065·84
June,	2,718	7,470·22	2,037	6,888·81	4,755	13,859·03	10,009·49	6,921·86	16,931·35	30,790·38
July,	2,202	5,727·76	2,057	5,758·51	4,259	11,486·27	7,839·59	6,135·95	13,975·54	25,461·81
August,	2,425	6,720·43	1,970	5,863·45	4,395	12,583·88	10,745·94	6,429·93	17.175 87	29,759·75
September,	2,740	9,404·83	1,807	6,104·20	4,547	15,509·03	30,447·81	6,647·68	37,995·49	52,604·52
October,	3,561	11,960·36	2,589	8,634·16	6,150	20,594·52	26,998·06	21,839·99	48,838·05	69,432·57
November,	3,540	11,569·93	2,467	7,963·39	6,007	19,533·32	14,906·51	13,290·15	28,196·74	47,730·06
December,	3,634	9,479·45	2,855	8,154·35	6,489	17,633·80	10,606·33	20,937·22	31,543·55	49,177·35
Total,	43,945	117,294·52	33,634	91,310·79	77,579	208,605·31	201,481·22	186,152·78	387,634·00	596,239·31

Income from Freight and Passage as above,		$596,239·31	
" " Through Tickets sold by Georgia Railroad Company,		13,543·62	
Total Freight and Passage,		$609,782·93	
" " Transportation of the Mails,		40,050·01	
" " Negro wages, Oak wood sold, and other sources,		5,316·86	
" " Sales of negro man "June,"		300·00	
" " Capital Stock,	5·00		
" " Cancelled Dividends,	120·50		
		125·50	
Total Income for the year 1847,			$655,575·30

THOMAS WARING, *Auditor.*

No. 5.—Statement of the number of Bales of Cotton, &c., received in Charleston by the Railroad, from 1st January to 31st December, 1847.

Months.	Hamburg.	Aiken.	Blk'ville.	Midway.	Brch'ville.	Way H. R.	Tot. H. R.	Columbia.	Gadsden.	Lewisville.	Orangb'g.	Way C. B.	Tot. C. B.	G. Total.
January, - -	13,256	45	716	386	85	359	14.847	11,498	1,136	324	226	712	13,896	28,743
February, - -	10,457		534	166	44	138	11,339	6,960	680	471	191	444	8,746	20,085
March, - -	6,069	54	144	15	41	61	6,384	2,380	23	28	12	121	2,564	8,948
April, - - -	9,497	28	62	35	24	18	9,664	6,437	164	272	31	52	6,956	16,620
May, - - -	5,102	22	43	75	142	6	5,390	6,626	72	82	22	207	7,009	12,399
June, - - -	701		1	30			732	454				38	492	1,224
July, - - -	1,601						1,601	606	24				630	2,231
August, - -	2,880						2,880	1,115	58			3	1,176	4,056
September, -	1,306			41	3	10	1,360	1,334	245	240	115		1,934	3,294
October, - -	9,246	22	119	157	76	75	9,695	4,538	488	253	42	632	5,953	15,648
November, -	4,883	22	128	82	21	9	5,145	3,238	238	179	37	419	4,111	9,256
December, -	8,151	34	122	97	26	21	8,451	2,766	127	123	43	288	3,347	11,798
Total,	73.149	227	1,869	1,084	462	697	77,488	47,952	3,255	1.972	719	2,916	56.814	134.302

Flour, 19,043½ bbls. | Wheat, 4,087 bush. } equal to 59,721 bales of
Corn, 334,761 bush. | Turpentine, 3,186 bbls. } cotton of 400 lbs. each.

Statement of the number of Packages and Pieces forwarded on the Railroad (up) from 1st January to 31st December, 1847.

Months.	*Pieces & Packages.*	*From No. of Vessels.*
January,	3,139	31
February,	3,150	22
March,	7.966	32
April,	10,315	41
May,	5,778	35
June.	3.248	28
July,	3,213	23
August,	3,858	23
September,	17,259	43
October,	19.584	43
November,	15 261	44
December,	3,122	28
	95,893	393

Statement of Articles received by the Railroad and forwarded to other places, from 1st January to 31st December 1847.

3022	Bales Cotton.	3	Tierces Sundries.
28	" Waste.	281	Boxes. "
746	" Yarn.	16	Trunks. "
63	" Domestics.	33	Packages. "
2	" Wool.	8	" Copper.
16	" Fur Skins.	22	" Castings.
4	" Rags.	4	Bells.
548	" Pink Root, &c.	1	Chair.
1050	Bags Feathers, Wax, &c.	2	Copper Boilers.
78	" Wheat.	3	Soda Founts.
4	" Dried Peaches.	103	Bars Iron.
81	Bbls. Sundries.	69	Pigs "
6	hlf'do. "	98	Pieces Bloom Iron.
13	Kegs. "	1	Lot Old Iron (16 tons.)
9	Hhds. "	11	Packages Rope.
9	Casks. "		
	Total,	6334	Pieces and Packages.

THOMAS WARING, *Auditor.*

Niagara Falls Suspension Bridge.

The suspension bridge companies have decided on the construction of the bridge for the passage of railroad trains. The strength of the supporting cables is to be not less than 65,000 tons. The cost is not to exceed $190,000; and the work to be completed by the 1st of May, 1849. Charles Ellet, Jr., Esq., of Philadelphia, has been appointed the engineer. The bridge will be in sight both of the cataract and the whirlpool, and span the gorge by an arch of 800 feet, suspended 230 feet above the surface of the Niagara river. **Hunt's Merch. Mag.**

Large Railway Girders.

Within the last few days some interest has been excited at Witham by the arrival of some very large-sized cast-iron girders, for two of the bridges on the line. These girders, which were cast at Derby, are said to be the largest single girders which have ever been cast, with one exception; they are fifty-three feet four inches and a half in length, and weigh about thirteen tons each. **London Artizan.**

Cost of Locomotives in France.

In 1839, the price of locomotives in France was 300 francs the 2 cwt.; the price in 1847 is 225 francs. In 1839 the French workshops produced only twenty to twenty-five locomotives per annum; in 1847 the railways can obtain 300 to 400 locomotives from the workshops of Paris, Rouen, Creuzot, Mulhausen, and Arras. **Ibid.**

AMERICAN PATENTS.

List of American Patents which issued in the month of February, 1847, with Exemplifications, by CHARLES M. KELLER, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For an *Improvement in Closing Doors;* Daniel Ball, Albany, Albany county, New York, February 1.

The patentee says,—"The nature of my invention consists in applying the compound lever, or knee joint, to doors, so as to close them by a weight, without the interposition of a spring or chain, which are so liable to be deranged."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the compound lever and weight, with a door, for closing the same, substantially in the manner and for the purpose set forth, without interposing a chain or other flexible fixture."

2. For an *Improvement in Attachments to Piano Fortes;* Moses Coburn, Savannah, Chatham county, Georgia, February 1.

This is for an invention similar to what is known as Coleman's Æolian attachment, the patentee having, on a hearing, proved to the satisfaction of the Commissioner of Patents, that he had made his invention prior to Coleman.

The patentee says,—"The nature of my invention consists in combining with a piano forte of any known construction, a set of metallic reeds, similar to those used in accordeons, and other instruments of a like character, said reeds being tuned to the strings of the piano forte, and being played by the same keys, so as to produce the combined effect of a wind and stringed instrument."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the employment of a series of metallic reeds, tuned to the strings of a piano forte, in combination with said strings, so as to be played upon by the same keys that act on the strings of the piano, and at the same time; the whole being constructed as above set forth, or in any other manner substantially the same."

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3. For an *Improvement in Shower Baths;* H. H. King, city of New York, February 1.

The patentee says,—"The nature of my invention consists in constructing a shower bath, with hollow standards pierced with holes, so as to produce a jet of water on all sides, as well as the usual shower from above, which can be used separately, or in conjunction with the said shower, at will."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is constructing a shower bath with lateral jets, formed by the vertical standard, substantially in the manner and for the purpose described."

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4. For an *Improvement in Stoves;* Charles W. Grannis, Collins, Erie county, New York, February 1.

"The nature of my invention," says the patentee, "consists in the manner of heating air and conveying it to the oven of an elevated oven stove, it being applicable at the same time to all the different forms of stoves with elevated ovens."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the air-heating apparatus with the stove and elevated oven, substantially in the manner described."

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5. For an *Improvement in hardening Hat Bodies;* Samuel Lyon, Roxbury, Norfolk county, Massachusetts, February 5.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the improvement by which I effect the hardening of a hat body, viz: by means of a conic frustrum or block, upon which the body is placed or formed, and a damp cloth applied to the fibrous

matter upon the block, in combination with a hollow vessel surrounding the whole—the block having a short reciprocating motion upon its axis, imparted to it when placed within the vessel, and the whole being made to operate together, as specified.

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6. For an *Improvement in the self-adjusting Truss;* A. W. Patterson, Pittsburg, Allegheny county, Pennsylvania, February 5.

We make the following extract from the specification:

"The peculiar nature of this invention consists in furnishing the block the desirable property of always preserving a *common centre*, when any part of it is acted upon, thereby enabling it to adapt itself to any movement made by the patient, and to remain firmly fixed to the parts, whatever attitude they may take; *consequently* avoiding all liability to permit a rupture to escape from underneath it, either by displacement, or a portion of it raising from the parts to which it is applied, while its fine susceptibility to yield to any movement happily obviates the necessity complained of in wearing other trusses with wood blocks—these it accomplishes:

"1st. By a central principle of motion, which it executes by yielding centrewise, when acted upon too severely by the body spring, or other agents.

"2d. By a circular principle of motion which it performs around a common centre, when pressed laterally, to produce the same.

"3d. By a rocking principle of motion which it is enabled to perform in any direction, as exigency may require."

Claim.—"What I claim as new, and desire to secure by letters patent, is the mode or manner of producing this universal self-adjusting property of the block, combined by the three principles above explained and developed—that is to say, I claim the before described peculiar combination and arrangement of the half elliptic springs, crossed at right angles, centre pin and plate, arranged and operating in the manner and for the purpose above set forth, or any other combination and arrangement analogous thereto, producing like results."

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7. For an *Improvement in the manufacture of Tree-nails;* E. Weber and Nathan O. Mitchell, Gardiner, Kennebec county, Maine, February 5.

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the combination of the revolving pinion socket, the stationary double trumpet-mouthed socket, and gouge shaped cutter, with the sliding socket and bevelled cutter, constructed, arranged, and operated in the manner and for the purpose described."

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8. For an *Improvement in Floating Sectional Docks;* Samuel Loveland, Oswego, Oswego county, New York, February 5.

Claim.—"What I claim as new, and desire to secure by letters patent, is the combination of the air tight chambers with the large buoy-

ant chambers, by means of the guiding gauge-posts for the purpose of regulating the degree of emersion of the buoyant chambers and the parts attached thereto when not in use, submerged entirely below the surface of the water, for protecting the same from decay."

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9. For an *Improvement in Dressing the Sides, Rounding the Edges, and Punching the Holes in Slats for Venetian Blinds;* Lott McGill, Philadelphia, Pennsylvania, February 5.

Claim.—"What I claim as new, and desire to secure by letters patent, is the combination of the pitman, the sliding frame, the driving bar, the spring clamps, the sliding piece and the drivers connected to the same; the planes and drivers, the planes, the steel plates and guard bars between the planes, the drop guards and the planes, and the punches, arranged and operating with each other and with the other parts of the machine respectively, substantially in the manner and for the purpose set forth."

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10. For an *Improvement in the Knives of Machinery for Cutting Straw;* F. D. Sampson, East Brookfield, Worcester, Massachusetts, February 5.

Claim.—"I claim as my invention, a rentering, angular, transversal curved knife, and an elevated angular knife bar in combination with each other, and constructed and arranged with respect to the feeding trough, and operating together, substantially in the manner and for the purpose specified.

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11. For an *Improvement in the Safety Fuse for Blasting Rocks, &c.;* Richard Bacon, Simsbury, Hartford, Connecticut, February 5.

The patentee says,—"My improvement consists in providing for communicating the fire with more certainty to the charge, to effect which I insert lengthwise through the fuse and as near the centre of the powder or other combustible matter as may be, a thread saturated with a solution of nitre, sulphur, or any other combustible material or substance. To the above is the claim limited."

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12 For an *Improvement in Composition for adding to Paints;* Robert Braman, Baltimore, Maryland, February 5.

To make one gallon and a fourth of paint of a permanent and durable body:

Take one gallon of rain water,

Three pounds of gum shellac,

Three ounces of pearl ash, and put them into an iron vessel and boil them slowly over a moderate fire without stirring them until the ingredients are well incorporated.

Claim.—"What I claim as my discovery, and desire to secure by

letters patent, is the before-described composition to be added to paints ground in oil or otherwise, for producing the effects described."

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13. For an *Improvement in Harness Pads;* Charles Pope, and Kasson Frazer, Syracuse, Onondaga, New York, February 5.

The nature of this invention, the patentees inform us, consists in providing the pads, which may be used in a harness or saddle, with movable joints which will allow the pads to regulate themselves to the various condition of the animal.

Claim.—"What we *claim* as our invention or improvement, and desire to secure by letters patent, consists in the combination of a joint or joints with the *pad plates* and yoke, in the various kinds of harnesses and saddles, so as to allow them to change their angle or position to conform to the shape of the back of the horse or other animal on which the same may be used."

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14. For an *Improvement in constructing Wrought Iron Cannons;* Albert Eames, Chicopee Falls, Hampden, Massachusetts, February 5.

The patentee says,—"The nature of my invention consists in a peculiar manner of connecting the staves and hoops of wrought metal cannons, by making the calibre or bore of a series of staves held together by a second series of staves, breaking joints with the first series, and embracing dovetailed or other projections on them, and then the whole bound together by hoops or rings.

Claim.—"What I do claim as my invention, and desire to secure by letters patent, is connecting together the iron series of staves by means of the outer or second series, breaking joints with the first, and embracing projections thereon, substantially as herein described. And I also claim the hoops or rings in combination with the two series of staves put and connected together in the manner herein described, whereby the whole is bound and properly secured together, as herein described."

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15. For an *Improvement in the mode of preparing the meal of flaxseed, and other oleaginous seeds, for the purpose of expressing the Oil;* Elijah Horner, East Brook, Mercer county, Pennsylvania, February 9.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of cream of tartar and sal æratus with ground flaxseed, or other oleaginous seeds, previous to the usual process of steaming, and them steaming the same, substantially in the manner and for the purpose set forth."

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16. For an *Improvement in making or setting up Hat Bodies;* Alva B. Taylor and A. B. Burr, City of New York, February 9.

This is granted for improvements on a machine patented by Henry

A. Wells, on the 25th of April, 1846, and clearly described in the list of patents in this journal.

Claim.—"What we claim as our invention, and desire to secure by letters patent, is, first, making the sides of the trunk of thin sheet metal, or other substance, which will bend with facility and retain the form given, in combination with the movable top, for the purpose of adapting the form of the mouth or delivery aperture of the trunk, to any size or form of former, and to the regulation of the deposit, of the fibres on the former, to determine the thickness of the hat, substantially as herein described.

"Second. We claim so connecting the top of the trunk with the sides thereof, that it can be elevated or depressed at pleasure, to increase or decrease the height of the mouth or delivery aperture of the trunk, and adapt it to any size of former that may be used, substantially as herein described.

"Third. We claim the valve or shutter, in combination with the trunk, substantially as described, for the purpose of regulating or stopping the current of air through the trunk, as described. And,

"Fourth. We claim the addition of the roller or rollers, covered with cloth or other analagous substance, producing like results, in combination with the feed rollers and rotating brush, substantially as described."

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17. For an *Improvement in re-action Water Wheels;* James Armstrong and Hardy Herring, Lisbon, Sampson county, North Carolina, February 9.

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the combination of the frustrum of a solid cone, frustrum of a cone hoop and spiral wedge-shaped floats, substantially of the form and in the manner herein set forth, for the purpose of forming a frustrum of a cone water wheel, of the precise form and arrangement as described."

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18. For an *Improvement in the Mariner's Compass;* Ralph Reeder, Cincinnati, Ohio, February 9.

Claim.—"What I claim therein as new, and desire to secure by letters patent, is the manner set forth, of combining a chronometer and a universal sun-dial, with the respective circles and arcs of circles containing the graduations for the course or points of the compass, the hours, the latitude and altitude; the respective parts being arranged and operating substantially in the manner and for the purpose fully made known; and this I claim, whether the said parts be formed precisely in the manner described and represented, or in any other that is the same in its principles and results."

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19. For an *Improvement in Pneumatic Springs for rail road cars, &c.;* John Lewis, New Haven, Connecticut, February 10.

We make the following extract from the specification:

"The nature of my invention consists in applying the elasticity of

atmospheric air, or any permanently elastic gas, by means of an expanding and contracting chamber, or chambers, made in one, two or more parts, and connected together by means of two or more belts of india rubber cloth, or other flexible or impermeable material, with alcohol or other liquid interposed, the more effectually to prevent the escape of the air or gas contained in the apparatus, and to aid in relieving the flexible connexion, and preventing its rupture by the action of the weight or force on the spring. This mode of connecting two vessels being applicable, without the air, to other purposes, such as hydraulic presses, &c., by forcing water into or between the two vessels. And my improvement also consists in providing this apparatus with one or more of what I denominate a *respiratory chamber*, or chambers attached to one or both ends of the apparatus, and separated from the main chamber of the apparatus by a diaphragm, or diaphragms, perforated with holes, which will check the passage of the air, and thus relieve the apparatus from the injurious effects of sudden shocks."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is, first, the method of connecting the two vessels, composing the pneumatic spring, bumper, press, &c., by means of two or more belts, with alcohol or other liquid interposed, substantially as described, to be used for the purposes above set forth.

"Second. I claim so arranging the two vessels, and the connecting belt or belts, substantially as described, that the belt or belts shall, at all times, be sustained by either one or both of the vessels, to prevent them from being ruptured by the pressure of the contained fluid as described.

"Third. I claim dividing the space between two disks into one or more spaces by means of a perforated diaphragm, or diaphragms, to form what I denominate a respiratory chamber, (or chambers) substantially as described and for the purposes explained above.

"Fourth. I also claim making the inner periphery of the outer vessel, or the outer periphery of the inner vessel, or both, beveled or conical, so that the space between the two, in which the flexure of the connecting belt or belts takes place, shall be diminished as the pressure increases, as described, for the purpose of enabling the flexible connexion the better to resist the increased pressure, as described; and this I claim, whether used with or without the other improvements."

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20. For an *Improvement in making Barrels, Hogsheads, &c.;* T. Molinier, of France, Resident of the State of Louisiana, February 10.

"The nature of my invention," says the patentee, "consists in making cooperage generally by a mechanical process. The character of my invention consists in performing, simultaneously and rapidly, several operations which are made but successively in cooperage."

Claim.—"What I claim as my invention, and desire to secure by letters patent, are the following parts:

"1st. The combination of the revolving tools with the carriage, for preparing completely the staves taken from my press, that is, for giving said staves a required length, making their notches, and emptying

their centres;—said revolving tools effecting simultaneously those three operations.

"2d. The two parts that I call "Systems of Headpieces," as described; which systems hold the headpieces of the barrel at the height of the notches with a mathematical precision, during the pressing; said systems of headpieces being furnished with spring circles, which govern the staves, and maintain them in a convenient position for the forming or making up the barrel."

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21. For an *Improvement in Wrought Iron Rails;* Thomas Grenell, Newark, New Jersey, February 13.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the peculiar arrangement of the saddles, and the mortice in the ends of the rail for screwing it to the sleeper, and by this peculiar fastening, I am enabled to form a rail which can be worn on both sides, by shifting the rail from track to track, and reversing the base and top as often as the wear requires it, thus bringing all the four corners to the action of the wheels, as described."

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22. For an *Improvement in the apparatus for the cure of the curvature of the Spine;* Cyrus Knapp, Cincinnati, Hamilton county, Ohio, February 13.

Claim.—"What I claim as new, and desire to secure by letters patent, is the combining, in the manner shown, of the adjustable hip and arm pieces, by means of the adjustable standards, so as to establish an extension and counter extension of the vertebral column between the integuments of the hips, and of the axillæ; the respective parts being combined and operating substantially in the manner and for the purpose herein described and represented. I also claim the combining of the head piece with the main body of the elevator, said head piece being constructed and connected as set forth."

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23. For an *Improvement in Cutting, Threshing, and Cleaning Grain;* D. A. Church and L. O. Obert, Friendship, New York; and W. W. Willoughby and O. F. Willoughby, Chicago, Illinois, February 13.

Claim.—"What we claim as new therein, and desire to secure by letters patent, is the manner set forth of constructing the separator, so that it shall consist of separate combs, turning on pivots, in endless chains, and operating in the manner made known."

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24. For an *Improvement in Bleaching Rosin White;* Joseph W. Harman, Williamsburg, Kings' county, New York, February 20.

Claim.—"What I claim as new, and as my invention, and desire to secure by letters patent, is the mode of bleaching rosin white, by

means of alkali, artificial heat, and water, combined and connected in process substantially as described, so as to extract the coloring matter from the rosin."

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25. For an *Improvement in Fire Escapes;* W. W. Van Loan, Catskill, Greene county, New York, February 20.

Claim.—"What I claim as new, and desire to secure by letters patent, is the employment of a case or tube of canvass, furnished with hooks or other devices, by which it may be attached to a window frame or other convenient support, in the manner and for the purpose herein fully made known; the whole structure and operation of said apparatus being substantially the same with that described."

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26. For an *Improvement in ascertaining the height of water in Steam Boilers;* Henry R. Worthington, City of New York, and W. H. Baker, Williamsburg, King's county, New York, February 20.

Claim.—"What we claim therein as new, and desire to secure by letters patent, is the application of the principle of percussion to that purpose, substantially in the manner fully set forth, namely, by causing a piston, or other flat surface, to strike horizontally, and with percussive force, upon the surface of the water, within a cylinder or other suitable vessel, into which steam and water are admitted from the boiler, whether under the precise arrangement herein described and represented, or under any other which is the same in principle and operation."

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27. For an *Improvement in dressing Mill Stones;* Asa Fisk, Jr., Leander D. Rumsey, and O. S. Gregory, Sullivan, Tioga county, Pennsylvania, February 20.

"The nature of our invention," say the patentees, "consists in so combining a set of cold chisels with an adjustable machine, arranged upon a frame work base and sliding carriage, that, by turning a crank with one hand, rapid motion is imparted to the chisels, and by operating other parts of the machine at the same time, with the other hand, the chisels are made to traverse the stone in such a manner as to form an even surface, or to cut the grooves in the mill stone."

Claim.—"What we claim as new, and desire to secure by letters patent, is the giving the dressing machine and chisels an inclined movement upon the sliding carriage, (corresponding with the inclined side of the furrows of a mill stone,) by means of the inclined planes, (on the side pieces of the sliding carriage,) and the projections, (on the shoe pieces of the dressing machine,) combined with each other, and with the hand wheel, the pinion, cog wheel, and rack, substantially in the manner herein set forth."

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28. For an *Improvement in Cooking Stoves;* Jas. H. Conklin, Peekskill, Westchester county, New York, February 20.

Claim.—"What I claim as my invention, and desire to secure by

letters patent, is the centre flue, between the ovens, communicating directly from the fire place to the flue back of the ovens, so that the fire shall pass between the ovens, (and not hot air simply,) and thereby producing a greater heat between the ovens, and in combination therewith, the arrangement of the flues, preserving a uniform heat around both ovens as set forth."

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29. For an *Improvement in Tailors' Sliding Scales, for cutting Coats, &c.;* Thomas Watt, Hubbard township, Trumbull county, Ohio, February 20.

The patentee says:—"The nature of my invention consists in a certain sliding pattern, or scale, marked and graduated upon the pattern, so as to be set, moved, or be adapted to any size or fashion, for the garments of coats, pantaloons, and vests."

Claim.—"What I claim as my invention and desire to secure by letters patent, is the sliding scale and pattern, or patterns, for cutting coats, vests, and pants, by the parts aforesaid, patterns moving upon pinions and gains to any given size, in the manner herein described."

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30. For an *Improvement in Ploughs;* George Bartlett, Smithfield, Providence county, Rhode Island, February 20.

Claim.—"I claim the location of the joints near the line of draught, or, in other words, near the axis about which the plough should, and ordinarily does, revolve, when rolled, for the purpose of guiding it."

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31. For an *Improvement in Railway Switches;* Andrew Ralston, West Middletown, Pennsylvania, February 20.

Claim.—"What I claim as new, and desire to secure by letters patent, is the combining with the central cross tie of the switch, the stud, the detaching plate, the lever, the spring, and the friction plate, with the apertures in the same, in such a manner that the forward motion of the guiding wedge, (of the form herein set forth,) secured to the front end of a locomotive, will unfasten and move the switch to the desired position, and the switch re-fasten itself again, substantially as herein set forth."

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32. For an *Improvement in Artificial Incubation;* L. G. Hoffman, Albany, New York, February 20.

The patentee says,—"The nature of my invention consists in the peculiar manner in which I construct my apparatus for hatching eggs, by heat derived from warm water."

Claim.—"I claim the oven enclosing the chest of drawers, and surrounded by a jacketing, formed by constructing the top, bottom, and sides with double plates, placed at a suitable distance apart, the internal forming a tight receptacle for water, in combination with either or both the heaters; the former being intended to operate with char-

coal, or other suitable fuel, and the latter by the flame of a lamp, as herein set forth and described.

"I also claim the mode in which I have combined the brooding chamber with the oven, so as to be heated thereby, viz: by cutting out a portion of the top of the former, to receive the projecting portion of the jacketing of the latter, as herein before described.

"And I further claim the mode of throwing the waste heat of the lamp into the brooding chamber; the whole being constructed and operating substantially in the manner and for the purposes herein described."

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33. For an *Improvement in Corn Shellers;* Reuben Chalfant, West Grove, Chester county, Pennsylvania, February 27.

The nature of this invention consists in the combination of springs and the division board, between said springs, to prevent the excessive vibration of the stop holder or corn reserver, to strike, and to throw against the pin wheel, and bevel wheel, to save the same from being injured.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the springs with the division board, or stop, placed between them substantially in the manner described."

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34. For an *Improvement in Ploughs;* James H. Conklin, Peekskill, Westchester county, New York, February 27.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the share and confiner with the mould board, constructed, arranged, and operating in the manner and for the purpose set forth."

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35. For an *Improvement in Mixing and Breaking Dough;* Hosea Ball, Cincinnati, Hamilton county, Ohio, February 27.

Claim.—"I claim the combination of the breaker or worm, with the funnel and tube in the manner and for the purpose described."

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36. For an *Improvement in Shingle Machines;* William F. Fitch, Newport, Penobscot county, Maine, February 27.

The nature of my invention, says the patentee, consists in the attachment of a regulating apparatus to the shingle machine, which being properly adjusted for each bolt, will cause the rim of the carriage to correspond with the depth and length of the bolt to be sawed; so arranged that the moment the saw has separated the shingle from, or has ceased to operate on the bolt, the carriage will be detached from the feeding apparatus and run back to be reset for another shingle.

Claim.—"What I claim as new, and desire to secure by letters patent, is the regulating the run of the carriage to correspond with the depth or length of the blocks or bolts to be sawed, by means of the adjustable gauge, disk, bar, bent lever, arbor, arm, rods, adjustable

cam, pinion, vibrating bar, pulleys, cord, weight, supporter, latch, and the rack, combined and operating with each other, and with the spring catch and vibrating bar, substantially in the manner herein set forth."

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37. For an *Improvement in Planing, Tonguing, and Grooving Boards;* Joseph Powell, Nelson Barlow, and Edward Holden, St. Louis, Missouri, February 27.

Claim.—"What we claim therein as new, and desire to secure by letters patent, is, first, the combination of the pairs of feeding rollers, with the bed plate and the rotating reducing wheel, substantially in the manner and for the purpose herein set forth; viz: the placing the axles of the pair of feeding rollers preceding the reducing cutter wheel, and the axles of the pair of feeding rollers immediately following the same, respectively, out of a vertical line, with each other, thereby bringing the upper roller of each pair nearer to the shaft of the reducing wheel than the lower one, for the purpose of springing the board or plank to the bed plate, as herein more particularly described.

"2nd. We also claim the combination of the series of cutting disks, tonguing cutters and rollers, for the purpose of forming the tongue, on the edge of boards or plank, substantially as herein set forth.

"3rd. We also claim the combination of the cutting disks, the grooving cutters and rollers for the purpose of forming the groove in the edge of boards or plank, substantially in the manner herein set forth."

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38. For an *Improvement in the manner of Conveying Wagons, and other Wheeled Vehicles, with their Loads, across Rivers and other Waters;* Henry Stanton, Washington, District of Columbia, February 27.

Claim.—"What I claim as new, and desire to secure by letters patent, is the combining of floats made of India rubber cloth, or of other material that is water tight, and capable of being inflated, with a wagon, or other wheeled vehicle, in the manner and for the purpose herein set forth. I do not claim the use of such floats when attached to or making a part of boats, or other vessels, or floating bodies, for the giving buoyancy thereto, or for their conveyance across, or along rivers, or other waters, this application of such floats being well known, but I limit my claim as above stated, to their combination with wheeled vehicles, retaining their wheels; this being the essential feature of my improvement, and that upon which its whole novelty and utility are dependent, as it enables the wagon to pass into and out of the water, and also over shoals therein, in virtue of said combination of the floats and wheels."

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39. For an *Improvement in the Manufacture of Sugar;* Antoine M. F. Chevet, Parish of St James, Louisiana, February 27.

Claim.—"What I claim as my invention, and desire to secure by

letters patent, is not an apparatus, but the application of a temperature (higher than the temperature of ebullition under the atmospheric pressure) to the sugar cane juice in order to destroy the greatest part of the matter injurious to the sugar, and using increase of pressure which results from it, for removing the liquor out of the kettle and conveying it in contact with a purifying agent (lime for example); in such a manner, the juice is protected against fire, during the defecation or purifying, and during the deposit of coagulated matters and other impurities."

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40. For an *Improvement in the Manufacture of Leather Sword-Scabbards, or various other articles of a like character;* F. Durand and O. Pecqueur, citizens of France, February 27.

This improvement consists in splitting the leather within, and leaving the edges united, and then crimping or stretching it to the required form.

Claim.—"What we claim, is the process described for making, in leather, sword-scabbards, sheaths, tubes, wrappers, and cases for fire arms, and for other purposes, without the use of gluing, cementing, or sewing, as specified."

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41. For an *Improvement in Trusses;* Halvor Halvorson, Lancaster, Worcester county, Massachusetts, February 27.

Claim.—"I claim the rotary axis plate as combined with the main spring and arm and ratchet cam wheel, and operating substantially as above specified."

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42. For an *Improvement in Washing Gold Ore;* Jonathan Sullivan, Gold Region, Moore county, North Carolina, February 27.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the method of washing and saving gold by a combination of the semi-rotary *and convex form* of the surface of the basins, together with the apertures for the escape of water and sand, *at their centre*, and fitted with feeding troughs as described, the whole being constructed, combined, and operating substantially as herein set forth."

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43. For an *Improvement in Hanging Carriage Bodies;* John Speed, Crawfordsville, Indiana, February 27.

Claim.—"What I claim as my invention, is the combination of the shafts, the cranks, the connecting rods, brackets and taps, substantially as above described with their application to railway and other carriages."

44. For an *Improvement in Mortising Machines;* R. and S. Fairchild, (assigned to S. Fairchild,) Trumbull, Fairfield county, Connecticut, February 27.

The patentees say,—"The nature of our invention consists in the application of a spring upon the back of the chisel, or between the chisels, permitting the chips to escape as they accumulate between the spring and chisel, thus clearing the chips from the mortice, as hereinafter more fully described."

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the application of a spring in combination with chisels for mortising, for the purposes and in the manner specified."

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45. For an *Improvement in Metallic Pens;* Albert G. Bagley, City of New York, February 27.

We make the following extract from the specification:

"In my improvement I use thin strips of metal, but instead of cutting them into lengths required for pens, and then rolling the metal out and producing the barrel form by pressing the sheet metal in a die, I produce the required tenuity and barrel form by one operation, viz: by placing long strips of sheet metal upon a mandril, and drawing them through a suitable sized aperture in a draw plate. Afterward I place the barrel-shaped metal into a die, and cut it into lengths, and the shape of the pen, by the same operation."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the mode of producing the barrel form of metalic pens, by the use of a mandril and plate, as herein set forth."

STATISTICS.

A statement of the quantity of the following articles exported from the United States to foreign countries during the year commencing on the 1st of July, 1846, and ending on the 30th of June, 1847.

This statement was prepared at the Treasury Department for the Philadelphia "Commercial List." It will be seen that the total value of exports amounts to the enormous sum of $53,262,437 in a single year. The total exports were—

Flour,	bbls.	4,382,496	Rye flour,	bbls.	48,982
Wheat,	bush.	4,399,951	Ship bread,	"	160,980
Corn,	"	16,326,050	"	kegs	31,082
Corn meal,	bbls.	948,062	Rye, oats, &c.,	value	$1,600,962

Total value of the above articles, $53,262,457

During the year 1846 the exports were—

Flour,	bbls.	2,289,476	Rye meal,	bbls.	38,530
Wheat,	bush.	1,613,795	Ship bread,	"	114,992
Indian corn,	"	1,828,063	"	kegs	25,505
Corn meal,	bbls.	298,790			

The total value of which was $15,987,156

Increase in the value of the exports in 1847 over those of 1846, $37,275,271.

Of the quantity exported in 1847, Philadelphia furnished the following quota:—

Flour,	bbls.	461,347	Wheat,	bush.	612,312
Rye flour,	"	12,557	Corn,	"	1,336,295
Corn meal,	"	294,332	Rye, oats, beans, peas,	"	12,779

Hunt's Merch. Mag.

Marine Steam Engine Building in New York.

The impetus which recent circumstances have given to steam navigation, has increased the value of labor some 20 per cent. within the last year, and the amount now employed in the construction of steam engines for ships is fully doubled. To give an idea of the extent of this business, which is now, in fact, synonymous with ship-building, it will be only necessary to state, that one establishment, Messrs. Stillman, Allen, & Co.'s Novelty Works, employ one thousand men, wholly upon marine engines: Messrs. Secor & Co. have some eight hundred; Allaire's Works, eight hundred; Pease, Murphy, & Co., the same number; and a host of other foundries, employing more or less —all of whom are maintained and supported solely by the merchant marine.

Ibid.

Iron Trade of Philadelphia.

	1847.	1846.	1847.	1846.
	Pig Iron and Castings.		Wrought Iron.	
By Ches. & Del. Canal, lbs.	88,131,239	63,324,093	18,058,491	18,669,843
Delaware Canal,	47,020,021	43,193,081	327,852	106,389
Schuylkill Canal,	15,963,480	9,219,840	8,442,560	2,408,000
Reading Railroad,	14,778,510	22,343,230	20,725,040	9,372,910
Columbia Railroad,	9,146,500	2,549,600	21,506,500	9,008,100
Norristown Railroad,	10,075,520	10,288,789	3,184,320	
Total,	185,115,270	150,918,633	72,244,763	39,565,242
Equal to, in tons,	82,640	67,392	32,252	17,681
	Nails and Spikes.		Blooms.	
By Reading Railroad, lbs.	8,743,480	7,251,670	1,537,330	2,459,060
Columbia, "	7,213,700	21,500	1,323,300	7,251,670
Norristown, "		1,741,792	89,600	
Ches. and Del. Canal,	1,634,877			
Schuylkill Canal,	1,966,720	1,612,800	3,339,840	
Total,	19,558,777	10,627,736	6,290,070	9,710,730
Equal to, in tons,	8,731	6,278	2,808	4,335
kegs,	195,587	101,217		

Ibid.

Commerce, Revenue, Population, &c., of the United States.

The following statement of the commerce, revenue, population, &c., of the United States, from 1790 to 1847, inclusive, is derived from official sources.

Statement of the Commerce, Revenue, and Population of the United States, from 1790 to 1847.

Years.	Total Imports	Imports consumed in the U. States, exclusive of specie.	Foreign merchandise exported, exclusive of specie.	Total Exports	Imports of Specie.	Exp. specie, including American coin exported.	Tonnage.
1790	$23,000,000	$22,460,844	$539,156	—	—	—	478,377
1791	29,200,000	28,687,959	512,041	$10,012,041	—	—	502,146
1792	31,500,000	29,746,992	1,753,098	20,753,096	—	—	564,457
1793	31,100,000	28,990,428	2,109,572	26,109,572	—	—	520,764
1794	34,600,000	28,073,767	6,526,233	33,026,233	—	—	628,618
1795	69,756,268	61,266,796	8,489,472	47,989,472	—	—	747,965
1796	81,436,164	55,136,164	26,300,000	67,064,097	—	—	831,899
1797	75,379,406	48,379,406	27,000,000	56,850,026	—	—	876,913
1798	68,551,700	35,551,700	33,000,000	61,527,097	—	—	898,323
1799	79,069,148	33,546,148	45,523,000	78,665,522	—	—	939,409
1800	91,252,768	52,121,891	39,130,877	70,971,780	—	—	972,492
1801	111,363,511	64,720,790	46,642,721	94,115,925	—	—	947,492
1802	76,333,333	40,558,362	35,774,971	72,483,160	—	—	892,104
1803	64,666,666	51,072,594	13,594,072	55,800,033	—	—	949,172
1804	85,000,000	48,768,403	36,231,597	77,699,074	—	—	1,042,404
1805	120,600,000	69,420,981	53,179,019	95,566,021	—	—	1,140,368
1806	129,410,000	69,126,764	60,283,236	101,536,963	—	—	1,208,736
1807	138,500,000	78,856,442	59,643,558	108,343,150	—	—	1,268,548
1817	99,250,000	79,891,931	19,358,069	86,671,569	—	—	1,399,912
1818	121,750,000	102,323,304	19,426,696	93,281,133	—	—	1,225,185
1819	87,125,000	67,959,317	19,165,683	70,142,521	—	—	1,260,751
1820	74,460,000	56,441,971	18,088,029	69,691,669	—	—	1,280,167
1821	62,585,724	43,796,405	10,824,429	64,974,382	$8,064,890	$10,478,049	1,298,958
1822	83,241,511	68,395,673	11,476,022	72,160,281	3,369,846	10,810,120	1,328,690
1823	77,579,267	51,310,736	21,170,635	74,699,030	5,097,896	6,372,987	1,336,566
1824	80,549,007	53,846,567	18,322,605	75,986,657	8,379,835	7,014,522	1,389,163
1825	96,340,075	66,395,722	23,793,588	99,535,388	6,150,765	8,797,055	1,423,112
1826	84,974,477	57,652,577	20,440,934	77,595,322	6,880,966	4,704,533	1,534,191
1827	79,484,068	54,901,108	16,431,830	82,324,827	8,151,130	8,014,880	1,620,608
1828	88,509,824	66,975,505	14,044,578	72,264,686	7,489,741	8,243,476	1,741,292
1829	74,492,527	64,741,571	12,247,344	72,358,671	7,403,612	4,924,020	1,260,798
1830	70,876,920	49,575,099	13,145,857	73,849,508	8,155,964	2,178,733	1,191,776
1831	103,191,124	82,808,110	13,077,069	81,310,583	7,305,945	9,014,931	1,267,847
1832	101,029,266	75,327,688	19,794,074	87,176,943	5,907,504	5,656,340	1,459,450
1833	108,118,311	83,470,067	17,577,876	90,140,433	7,070,368	2,611,701	1,606,151
1834	126,521,332	86,973,147	21,636,553	104,336,973	17,911,632	2,076,758	1,758,907
1835	149,895,742	122,007,974	14,756,321	121,693,577	13,131,447	6,477,775	1,824,940
1836	189,980,035	158,811,392	17,767,762	128,663,040	13,400,881	4,324,336	1,882,163
1837	140,989,217	113,310,571	17,162,232	117,419,376	10,576,414	5,976,249	1,896,656
1838	113,717,404	86,552,508	9,417,600	108,486,616	17,747,116	3,508,046	1,995,640
1839	161,092,132	145,870,816	10,626,140	121,028,416	5,575,263	8,776,743	2,096,479
1840	107,141,519	86,250,335	12,008,371	132,085,946	8,882,813	8,417,014	2,180,764
1841	127,946,177	114,776,369	8,181,235	121,851,803	4,988,633	10,034,332	2,130,774
1842, to Sept. 30	100,162,087	87,996,318	8,078,753	104,691,534	4,087,016	4,813,539	2,092,391
1842, 3 mos. to December 30,	21,584,599	12,431,376	1,713,112	28,115,493	7,440,112	506,936	2,174,502
1843, 6 months, Jan. to June,	43,169,200	24,862,753	3,426,223	56,230,987	14,880,223	1,013,861	2,158,603
1844	108,435,035	96,590,548	6,214,058	111,200,046	5,830,429	5,454,214	2,280,695
1845	117,254,564	105,599,541	7,584,781	114,646,606	4,070,242	8,606,495	3,447,002
1846	121,691,797	110,048,859	7,865,206	113,488,516	3,777,732	3,905,268	2,562,085
1847	146,545,638	116,258,310	6,166,039	158,648,622	24,121,289	1,907,739	2,859,046

Years.	Population.	Years.	Population.	Years.	Population.
1790	3,921,326	1810	7,239,903	1830	12,866,620
1800	5,319,762	1820	9,654,596	1840	17,069,453

Ibid.

Statement showing the value of Cotton, and other Domestic Produce, exported from the United States, from 1790 *to* 1807; *derived from the Treasurer's Department, Washington, December,* 1*st,* 1847.

Years	Value of Cotton exp.	Other domestic produce ex.	Total exports.	Years	Value of Cotton exp.	Other domestic produce exp.	Total exports.
	Dollars.	*Dollars.*	*Dollars.*		*Dollars.*	*Dollars.*	*Dollars.*
1790	58,000	19,608,000	19,666,000	1800	4,984,000	26,856,903	31,840,903
1791	52,000	18,458,000	18,500,000	1801	9,160,000	38,277,204	47,473,204
1792	41,428	18,958,572	19,000,000	1802	5,225,000	31,483,189	26,708,180
1793	160,000	23,840,000	24,000,000	1803	7,809,000	34,396,961	42,285,961
1794	550,000	25,950,000	26,500,000	1804	7,620,000	33,847,477	41,467,477
1795	2,281,250	37,218,750	39,500,000	1805	9,276,666	33,110,336	42,387,002
1796	2,226,500	38,537,597	40,764,097	1806	8,250,000	33,003,727	41,253,727
1797	1,292,000	28,558,206	29,850,206	1807	14,233,000	34,466,592	48,699,592
1798	3,639,999	24,867,098	28,527,097				
1799	4,180,000	28,962,522	33,142,523		81,074,843	530,411,134	611,485,977

Ibid.

Production of Silver in Spain.

On the old continent, Russia is not the only State which has increased its production of precious metals. The progress has been almost general among such of the European States as possess them.—The success which Russia has obtained, has been striking—incomparable. Nevertheless, it will be seen that some other nations have also made progress worthy of being cited. At the commencement of the century, Europe, without counting Russia, (which we here take in its whole extent, both to the east and west of the Oural Mountains,) yielded, in pure metal, 1300 kilogrammes of gold, and 52,670 kilogrammes of silver. In 1835, the quantity of gold was about the same, but the production of silver was increased by about 15,000 kilogrammes. The production of gold and silver in Europe was, in 1835, as at the commencement of the century, concentrated in Germany, and in the lower part of the valley of the Danube—that is, to speak more precisely, in the Hartz Mountains, in Hanover; in those of Erzgebirge, which are divided among Saxony, Bohemia, and Prussia, in Hungary and Transylvania—the last two countries, let us repeat, having pretty nearly the monopoly of gold. Out of Germany, and the valley of the Danube, there was not produced in 1835 more than 10,000 kilogrammes of silver, of a value of about 2,000,000f., and from 20,000 to 25,000 kilogrammes of gold. Industry, which, since 1835, has taken a great extension in Europe, has paid more attention to the precious metals than it had previously done. At present, only little is wanting to make the production of silver double what it was in 1835.—The principal cause of this development is, that Spain, which possesses important silver mines, formerly very celebrated, has again begun to work them.

The mines of gold, and particularly of silver, in Spain, have enjoyed great celebrity. Strabo, whose exactitude is better appreciated every day, states the fecundity of them. Long before him, the prophet Ezekiel had signalized it in his threatening prophecies against Tyre. The deposits of silver in the peninsula were worked with success un-

der the Moors, as under the Romans. Since the country has had more liberty, the working has been resumed; and, at the same time, the numerous beds of coal, with inexhaustible mines of iron, which nature has placed in the Asturias, close to the sea, have begun to be worked with vigor.

The mines of lead, containing silver, situated in the kingdoms of Murcia and Granada, at a short distance from the Mediterranean, are those which formerly yielded, and still yield, a great quantity of silver. The lead, however, is not always associated with silver. The mines of Sierra de Gador, situated behind Almeria, which have yielded as much as 39,000,000 kilogrammes of lead, and still yield from 13,000,000 to 14,000,000 kilogrammes, do not contain silver; but the mines which are behind Carthagena, particularly at Almazarron, and still more particularly those that are worked in a little vale, called the Baranco Jaroso, in the Sierra Almagrera, in the kingdom of Granada, have a yield of silver very remarkable, being 1 per 100 with respect to the lead. Having been successively visited by several very intelligent French engineers, the mines of the South of Spain were, in 1845, worked anew by Mr. Pernolet, director of the mines of Pouliaouen, in Brittany. According to this gentlemen, the single mines of the Sierra Almagrera yield, at present, at least 40,000 kilogrammes of silver; and consequently, the total extraction of the whole peninsula cannot be estimated at fewer than 50,000 kilogrammes. Ibid.

Extracts from the Report of the Bureau of Topographical Engineers, in reference to the Commerce of the Lakes and Western Rivers; made through the Secretary of War to the U. S. House of Representatives—January 6th, 1848.—(Executive Doc. H. R., No 19, 1st Sess. 30 Cong.)

Consolidated return of exports and imports of the lake harbors for the year 1846.

Oswegatchie (district)	$ 180,555·00
CHAMPLAIN.	
Whitehall	6,327,489·00
Plattsburgh (district)	1,160,844·00
Burlington (district)	3,777,726·00
ONTARIO.	
Sackett's Harbor (district)	2,735,091·00
Dexter (port)	484,575·00
Salmon River or Port Ontario	423,724·00
Oswego	9,502,980·00
Big Sodus	39,206·00
Rochester	212,926·00
Pultneyville	20,342·00
Niagara (district)	606,863·00
Carried forward	25,472,321·00

Brought forward,	$25,472,321·00
ERIE.	
Black Rock	not known.
Buffalo (port)	48,989,116·00
Silver Creek	not known.
Irving	not known.
Portland	not known.
Conneaut (port)	380,475 00
Ashtabula (port)	715,467 00
Fairport (Grand River)	819,584·00
Cleaveland (port)	12,559,110·00
Huron	not known.
Sandusky (district)	5,943,127·00
Monroe (district) including Toledo	9,519,067·00
Detroit	8,706,348·00
Erie	6,373,246·00
Dunkirk	not known.
Black River (port)	215,040·00
Vermillion (port)	137,770·00
MICHIGAN.	
Chicago	3,927,150·00
St. Joseph	not known.
Grand River	"
Kalamazoo	"
New Buffalo	"
Michigan City	"
Mouth of Calumie	"
Little Fort	"
Southport	"
Racine	"
Milwaukie	"
Sheboygan	"
Manitowoc	"
	$123,829,821·00

There are several places of notoriety on the lakes enumerated in the above statement, but of which the exports and imports for 1846 are not known, because no returns have been received from them, or because the returns which have been received were too defective to be used. The foregoing amount may, therefore, be considered as below the true representation of the entire American lake commerce, and may be taken with safety as not an exaggerated value of that commerce. But there can be no doubt that the total exports and imports of these lakes, as represented in the above table, is a duplicate commerce—the exports of one place being the imports of another; it must not, however, be supposed as including a mere carrying trade, but as exports fairly shipped at a place, and as imports unloaded, and not being again involved as a part of the lake commerce. Applying

these considerations to the amount of commerce above stated, they will justify the assumption of half that amount as the net moneyed value of the lake commerce; or, in other words, that the net value of this commerce is, for the year 1846, $61,914,910. The same reasoning applied to the commerce of 1841 will make it, for that year, $32,913,011; showing the lake commerce to have nearly doubled itself in five years, and to have experienced an annual average increase of $17\frac{63}{160}$ per cent.

Extent of Steam Navigation on the Western Waters, including the rivers, bayous, &c., connected with the Mississippi by channels navigable for steamers. (From the same Document.)

The whole steamboat navigation of the Mississippi and its tributaries can be stated at 16,674 miles, as will be seen from the following table, furnished by Lieutenant Colonel S. H. Long, of the corps of topographical engineers:—

MISSISSIPPI AND ITS BRANCHES, BAYOUS, &C.

	Miles.		Miles.
Mississippi Proper	2000	Spring	50
St. Croix	80	Arkansas	600
St. Peter's	120	Canadian	60
Chippeway	70	Neosho	60
Black	60	Yazoo	300
Wisconsin	180	Tallahatchee	300
Rock	250	Yalabusha	130
Iowa	110	Big Sunflower	80
Cedar	60	Little Sunflower	70
Des Moines	250	Big Black	150
Illinois	245	Bayou de Glaze	90
Maremec	60	Bayou Care	140
Kaskaskia	150	Bayou Rouge	40
Big Muddy	5	Bayou La Fourche	60
Obion	60	Bayou Placquemine	12
Forked Deer	195	Bayou Teche	96
Big Hatchee	75	Grand River	12
St. Francis	300	Bayou Sorrele	12
White	500	Bayou Chien	5
Big Black	60		

MISSOURI AND BRANCHES.

Missouri Proper	1800	Kansas	150
Yellow Stone	300	Osage	275
Platte River	40	Grand	90

OHIO AND BRANCHES.

Ohio Proper	1000	Kentucky	62
Alleghany	200	Salt River	35
Monongahela	60	Green	150
Muskingum	70	Barren	30

	Miles.		Miles.
Kenhawa	65	Wabash	400
Big Sandy	50	Cumberland	400
Scioto	50	Tennessee	720

RED RIVER AND ITS BRANCHES, BAYOUS, &c.

Red River Proper	1500	Tensas River	150
Wachita	375	Lake Bistenaw	60
Saline	100	Lake Caddo	75
Little Missouri	50	Sulphur Fork	100
Bayou De Arboune	60	Little River	65
Bayou Bartholomew	150	Kiamichi	40
Bayou Bœuf	150	Boggy	40
Bayou Macon	175	Bayou Pierre	150
Bayou Louis	30	Atchafalaya	360

Total extent of Steamboat Navigation, 16,674

Extent of Lake Coast in the different States and Territories.

Lake Champlain is	105 miles long.	
Its greatest width	12 "	
Its average width	8 "	
Lake Ontario is	180 "	"
Its greatest width	52 "	
Its average width	40 "	
Lake Erie is	240 "	"
Its greatest width	57 "	
Its average width	38 "	
Lake St. Clair is	18 "	"
Its greatest width	25 "	
Its average width	12 "	
Lake Huron is	270 "	"
Its greatest width (not including the extensive bay of Georgian, itself 120 miles long, and averging 45 wide) is	105 "	
Its average width	70 "	
Lake Michigan is	340 "	"
Its greatest width	83 "	
Its average width	58 "	
Lake Superior is	420 "	"
Its greatest width	135 "	
Its average width	100 "	

MECHANICS, PHYSICS, AND CHEMISTRY.

Account of the Experiments to determine the Principal Laws and Numerical Data, which enter into the Calculation of Steam Engines, by M. V. REGNAULT.

SECOND MEMOIR.

On the Determination of the Density of Gases.

(Continued from page 283.)

The common method of determining the density of a gas consists in weighing a glass globe of great size:

1st. When the globe contains perfectly dry air of a known temperature, and under a known atmospheric pressure:

2d. After having exhausted it by means of the air-pump, so that the enclosed air exerts only a very feeble pressure, which, as well as the corresponding temperature, is noted:

3d. After having filled the globe with the gas perfectly purified, the atmospheric pressure and temperature being again noted:

4th. After having again exhausted the globe, noting, as before, the pressure and temperature.

By which four weighings, and their accompanying observations of pressures and temperatures, all the data necessary for determining the density of the gas are given. But this method requires the exact knowledge of several elements, the determinations of which present generally great uncertainty.

In the first place, the temperatures which the air and the gas present at the moments of closing the globe, must be very exactly known; but the method generally used of having a thermometer placed near the globe is very defective; the temperature indicated by the thermometer may be totally different from that of the air in which it is bathed, and still more so from that of the gas which fills the globe.

MM. Dumas and Boussingault, who have lately (Ann. de Chem. et de Phys., 3d series, Vol. III, p. 270) very successfully endeavored to determine the densities of certain gases, place the thermometer, intended to indicate the temperatures of the gases in the very centre of the globe, and for more security, they cause that temperature to be almost constant, by placing the globe in an inclosure formed by a large cylindrical vessel of zinc with double walls. The annular space left between the walls is filled with water at a temperature differing but little from that of the surrounding air. With this arrangement, we may admit that the temperature of the gas is known with sufficient accuracy.

But the greatest uncertainties exist in the weighings of the globe; for we must weigh the globe in the air, and, to have its true weight, we must add to its apparent weight, that of the air which it displaces. And, in certain cases, this latter weight is greater than that of the gas which fills the globe, so that it must be known with at least equal exactness.

We are, up to a certain point, masters of the gas which we pass into the globe. We may prepare it so as to be sure of its purity; but it is not so with the external atmosphere; we are obliged to take it as it is. In a close chamber the air may change its composition very perceptibly; its temperature, and the quantity of moisture which it contains, vary incessantly. MM. Dumas and Boussingault thought that they had completely avoided the errors arising from this source, by placing below their balance a large chest lined with lead, in which the globe suspended from one of the scales of the balance floats. A very sensitive thermometer is placed in this chest, and gives the temperature of the air. This arrangement is certainly far preferable to allowing the globe to hang freely in the air of the room; the globe suspended in the chest is kept from the currents of air which render the weighings very uncertain, and the temperature of the air in which it is placed changes but slowly; but it does not do away with the errors arising from the changes in the composition of the air, and these are by no means negligable, especially when we are working with very light gases, such, for instance, as hydrogen.

At the same time that MM. Dumas and Boussingault were weighing gases, M. Regnault was also engaged in the determination of the density of steam under different pressures, and especially under very feeble pressures. He was struck with the uncertainties which the ordinary methods of weighing gases present, especially owing to the alteration of the density of the surrounding air, which seems to have attracted but little attention from men of science, and he was led to a method which presents a degree of certainty and precision which those heretofore used do not offer.

He avoids completely, and by a very simple artifice, the uncertainties which arise from the changes in the air in which the globe is weighed. In place of equipoising it by means of weights on the opposite scale, he balances it by means of a second hermetically sealed globe of the same kind of glass, hung from the opposite scale. All the variations which take place in the air then affect the two globes in the same way, whether they arise from changes of temperature, barometric pressure, or composition of the atmosphere. It is not, therefore, required at the moment of weighing to watch the thermometer, barometer, and hygrometer; it is sufficient to wait until the two globes are in equilibrium of temperature, and when this is the case, it continues indefinitely. We have, in consequence, a very definite character by which to know when to read the weighings. This method presents also another advantage, that is, of avoiding the error arising from the different amount of moisture deposited upon the globe during different weighings. As the globes are made of the same glass, and equally dried before the commencement of the experiments, they may be assumed to condense the same amount of moisture when bathed in the same air, and, consequently, will remain in equilibrium.

The globes had a capacity of about 10 litres (2·2 gallons.) The globe in which the gas is to be weighed has a stopcock adjusted to it, so that it may be exposed to the temperature of boiling water with-

out leakage. It is weighed when full of water, first in the air, and afterwards in water of the same temperature as that which it contains; thus is obtained the weight of water displaced by the globe.

The balancing globe is so selected that the weight of water displaced by it is rather less than that of the first, even after the addition of its metallic mounting by which it is hermetically sealed, and hung from the opposite balance scale; there is then added to it a glass tube of such capacity as that the weight of water displaced by it shall just make up the difference.

Before closing the second globe, a quantity of mercury was introduced into it so as to render it about 10 grammes (154·38 grains troy) heavier than the other. The two globes thus adjusted were submitted to several tests, in order to be sure that they satisfied the required conditions; they were left hanging for fifteen days under the balance scales, and the equilibrium was rigorously maintained all this time, although in the interval the temperature of the air had changed from 0° to 17°, (32° to 62·5° Fahr.,) and the barometric pressure from 741 to 771 millimetres (29·6 to 30·8 inches.) The general mode of operating was as follows:—A vacuum as complete as possible being made in the globe, it is placed in communication with the apparatus for producing the gas whose density is to be determined, and the stopcock is opened in such a way that the gas in the apparatus preserves a slight excess of pressure. When the globe is filled with gas, it is again placed in communication with the air-pump, a very perfect vacuum made, and it filled a second time with the gas. In order to avoid any correction for temperature, a correction which would require the knowledge of the coefficient of dilatation of the gas, and that of the globe, the globe is placed in a zinc cover and completely enveloped in melting ice. Before closing the globe, it is placed in direct communication with the atmosphere, so that the gas may place itself in equilibrium with the exterior pressure.

The globe taken out of the ice is carefully washed and dried, and hung from the scale of the balance. It requires a long time, often more than two hours, for the globe to take exactly the temperature of the surrounding air, and for its surface to cover itself with its normal amount of moisture. The balance used was able to appreciate with certainty a half milligramme when charged with one killogramme upon each scale.* It was placed over a large chest, such as used by MM. Dumas and Boussingault. At the end of the weighing, the observer did not approach the balance, but observed the oscillations of the index at a distance, with a telescope.

M. Regnault then notices the electric effects produced by wiping the globes, and the effects upon the weighings; he avoided it by wiping the globes with a napkin dipped in distilled water, and tested them by the gold-leaf electrometer. The pressures were measured by an apparatus which he describes under the name of a barometric-manometer.

* That is sensible to one four millionth of the total load. Quere, whether this sensibility was determined after the globes had been hanging from the scales, and the balance in action for fifteen days? F.

It consists of two tubes, one of which is an ordinary barometer of 20 millim. (0.8 in. diameter,) made very carefully; the other is a glass tube of the same diameter, which may, by a lead tube, be connected with the vessel in which pressures less than that of an atmosphere are to be measured; they plunge below into a cistern of mercury having a partition, so that the two instruments may be separated at pleasure by drawing off the mercury in the cistern of the manometer below the top of the partition; this is necessary during the exhaustion of the globe, and the re-admission of the gas, for these operations produce such great oscillations in the barometer as to introduce small quantities of air into the instrument, and thus vitiate the vacuum. The exhausted globe is weighed with the precautions what have been indicated. If P represent the weight of the gas when the barometer stands at H, and p that weight when the elastic force in the globe corresponds to a barometric height h, the weight of the gas at 0°, and under the normal pressure of 760 mm., is, $\left(P-p\right)\frac{760}{H-h}$

To obtain a new weighing of the same gas, the exhausted globe, enveloped in ice, is placed in connexion with the apparatus for generating the gas, and the series of operations which have been pointed out, repeated. The gas thus becomes purer at each operation. M. Regnault found that it is only from the fourth filling that the gas presents rigorously the same weight. It is desirable to satisfy one's self whether the gas upon which we are operating follows the law of Mariotte, at pressures below those of the atmosphere; this verification is absolutely necessary if the density of the gas is to serve for the determination of atomic weights. For the law of the volumes of gases, and the simple ratios which exist between their densities and atomic weights, exist rigorously only *at the limit*, that is, in a state of extreme dilatation; we must therefore see whether the anomoly in these laws does not commence already near the atmospheric pressure.

This is done by measuring the weight of the gas, with great care, at different degrees of elastic force, as marked by the comparison of the manometer and barometer.

Finally, by this means we may determine the weight of the gas which fills the globe at the temperature of 100° and under atmospheric pressure, and thus determine the density of the gas when compared with air at 100°. This new density must be exactly the same as that calculated for 0°, in order that it may serve in the calculation of the atomic weights; for it is necessary for this purpose that the gas should have the same coefficient of dilatation as the atmospheric air; at all events the weight of the gas which fills the vessel at 100° compared with that which fills it at 0°, permits us to calculate the *coefficient of dilatation of the gas.**

Again, in order to determine whether the gas follows the law of Mariotte, at the temperature 100°, we have only to repeat the former experiments, filling the globe at this temperature, instead of at 0°.

*This is the only direct method which can be used for this determination, in gases which attack mercury.

M. Regnault then recapitulates the advantages of this method, which are, that it gives the density of the gases with more precision, and far less trouble, than the methods formerly used; it gives these densities at identical temperatures at 0° and 100°, that is, at the fixed points of the thermometer; and, consequently, gives immediately the coefficient of dilatation of the gas; and, finally, it permits us to determine with great exactness, whether the gas follows the law of Mariotte, at the temperatures of melting ice, and boiling water.

He then proceeds to give the detail of all his experiments, without a single exception, in order to allow the reader to judge of the degree of precision obtained by this method. It is not necessary that we should give these details—or those of the processes by which M. R. purified his gases, they were such as might be expected from one so familiar with all the minutiæ of physical science.

He first determined by nine experiments the weight of pure atmospheric air, freed from carbonic acid and watery vapor, which filled his globe at the temperature of 0°, and under the barometric pressure of 760 millim. (29·944 inches). The mean of these experiments was 12·7781 gr. The minimum, 12·7744. The maximum 12·7809. The difference 0·0065 or $\frac{1}{1977}$, very nearly $\frac{1}{2000}$ of the mean; and he remarks that it is probable that a great part of this error is due to the variations which occur in the composition of the atmosphere. He regards it as unfortunate that men of science should have selected the atmospheric air, whose constitution is known to vary, as the standard of densities for gases, in place of some gas which could always be obtained perfectly pure, such for instance as oxygen, which would be the more convenient since this gas is already chosen, as the basis of the tables (adopted by continental chemists) of chemical equivalents.

Founded upon this determination of the weight of a given volume of air, he proceeds to determine the densities of different gases, and his results are as follows:

	Tem. at 0° Bar. 760 m	Minimum.	Maximum	Difference.
Nitrogen, Mean of 6 Experiments,	0·97137	0·97108	0·97155	$\frac{1}{2000}$
Hydrogen, " 3 "	0·06926	0·06923	0 06932	$\frac{1}{770}$
Oxygen, " 3 "	1·10563	1·10561	1·10565	$\frac{1}{3000}$
Carbonic Acid, 5 "	1·52910	1·52900	1·52915	$\frac{1}{1020}$
" at 0° and 374·13 millim.	1·52366			
" " 224·17 "	1·52145			
" 100° 760·00 "	1·52418			
" " 383·39 "	1·52410			

Densities determined by Dumas and Boussingault.

Nitrogen, from - -	0·970	to	0·974
Hydrogen, " - -	0·0691	"	0·0695
Oxygen, " - -	1·1055	"	1·1058

If we calculate the theoretic density of carbonic acid gas, admitting for the atomic weight of carbon 75, (oxygen = 100, or 6 if hydrogen = 1,) lately found by M. Dumas, we get the number 1·52024, which approaches the density found for this gas under the pressure of 224·17 millim. (less than nine inches.)

The density found at the temperature 0° and normal atmospheric pressure leads to an atomic weight for carbon 76·6 which, approaches very nearly the number 76·44 (6·1152, if hydrogen = 1) which chemists for a long time admitted from the experiments of M. Berzelius.*

We see, by this example, how much circumspection is necessary in deducing the value of the atomic weight of a gas from its density.

Three experiments to determine the coefficient of dilatation of the air between 0° and 100°, gave as the result 0·03663, which differs but little from the value obtained in the first memoir.

An attempt to verify the law of Mariotte, showed slight differences in which the weights, by experiments, were always a little lower than those got by calculating the density by means of Mariotte's law from the observed elastic force, but these differences were always within the limits of the errors of observation.

The coefficient of dilatation of carbonic acid gas between 0° and 100° was determined to be 0·003719. (In the first memoir, the determination by the method V, in which the gas preserved the same elastic force at 0° and 100°, as in the present case, was 0·0037099.)

The experiments to determine whether carbonic acid gas obeys the law of Mariotte at pressures less than that of the atmosphere, gave the following results,

				By experiment.	Calculated by Mariotte's law.
Weight of the gas at	0°,	and with an elastic force	224·17 mm.,	5·7345 gr.,	5·7634 grs.
"	"	"	374·13 "	9·5845 "	9·6628 "
"	101·01°	"	338·39 "	6·3549 "	6·3545 "

so that it appears that carbonic acid gas deviates notably from the law of Mariotte at ordinary temperatures, but conforms to it with the limits of experimental errors at 100°.

(To be Continued.)

ERRATA.

In the March number of our Journal, page 12, line 4, for minimum, read maximum.
Line 5, for maximum, read minimum.
" " for 1·36812, read 1·36612.

On the Power of Low Pressure Steam in Charring Animal and Vegetable Matter, and on the reducing power of Charcoal at that temperature. *By* WILLIAM FERGUSON, Esq.

An unsound steam-engine boiler having been covered with patent felt, to prevent radiation from its surface, the felt was observed, at the expiration of five or six months, to have become charred wherever the steam made its escape through the cracks of the boiler, whilst those parts of the felt which remained dry, although exposed to the

same heat, were perfectly unaltered. The boiler was worked under a pressure of 6 lbs., which corresponds with a temperature of 232° F., but the temperature of the escaping steam and of those parts of the felt in contact with it, was 212° F. Another instance in which wood had been charred was observed in the float-gauge of a brewing-copper, which had been exposed during five years to the vapor and the saccharine solution, at a temperature not exceeding 215° or 216° F. The charcoal in this case was permeated by a soluble salt of copper, and the interstices were filled with octahedral and dedocahedral crystals of metallic copper. The author concludes, from the odor of pyroligneous acid which was perceptible, that acetic acid was formed by the decomposition of the wood, and that this united with the copper to form an acetate, which even at the temperature of 216° F., was partially reduced to the metallic state, whilst in intimate contact with the porous charcoal. **Lond. Jour. Chem. Soc.**

White Paint Manufactured from Antimony.

At the Liverpool Polytechnic Society, Mr. J. A. Forrest described a new mode of manufacturing white paint of an excellent body, superior to that manufactured from lead. It is made from oxide of antimony, and has many advantages. He had ascertained, that though it was now high in price, were there a demand for antimony, that metal could be obtained in abundance at about £12 a ton, whereas the lead used costs £24 10s. The new paint was, consequently, much cheaper; it was not so apt to lose its color, and would spread over a much larger surface than an equal weight of the paint manufactured from lead. **Civ. Eng. & Arc. Jour.**

New Method of Making Chloroform.

TRANSLATED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

MM. Hurant and Larocque recommend a modification of Soubeiran's method for the preparation of chloroform; which material, they think is likely to prove useful in the arts owing to its power of dissolving notable quantities of such substances as caoutchouc, shellac, gum copal, while on the other hand it also dissolves easily, bromine, iodine, the essential oils, the vegetable alkalies, the fats, &c.

They proceed as follows: they take 35 litres (about 9¼ galls. U. S.) of water, and bring it to a temperature from 97° to 104° Fahr. They then stir into it 5 kilogrammes (11 lbs.) of lime previously slacked, and 10 kilogrammes (22 lbs.) of the chloride of lime of commerce: they then pour in 1½ litres (1½ qts.) of alcohol of spec. grav. 0·85: then, when they are thoroughly mixed, the joints of the apparatus are luted, and the mixture brought to boiling. The operation is carried on, and the chloroform separated as usual. Only in place of distilling the liquors which swim upon the chloroform, as M. Saubeiran recom-

* Berzelius himself now acknowledges the error of his former determination, and fixes the atomic weight of carbon at 75·12 or 6·01 (H = 1) which amounts to an admission of Dumas' determination. (Berzelius Traité de Chimie, Seconde Edition Française, Paris, 1845, tom. 1, p. 263.) F.

mends, they are preserved for a subsequent operation, which is commenced immediately. For this, without removing any thing from the retort, introduce into it, 10 litres (3 galls.) of water, and when the liquor has again reached the temperature of 97°—104°, add from 3 to 4 kilogrammes (6½ to 9 lbs.) of lime, and 10 kilogrammes (22 lbs.) of chloride of lime, add but 1 litre (1 quart) of alcohol, and after stirring them well together, add the liquors from which the chloroform of the preceding operation was separated, and proceed as before. With an alembic of sufficient size, a third, and even a fourth operation may be gone through in the same way.

Operating in this way, MM. Hurant and Larocque obtained from 4½ litres (1¼ galls.) of alcohol of spec. grav. 0·85—

By the First Distillation,	550	grammes	of	chloroform,
Second,	" 640	"		"
Third,	" 700	"		"
Fourth,	" 730	"		"
	2620	"		"

or about 5¾ lbs. of chloroform, which at the cost of materials and labor and pains, would make it cost about 14 francs per kilogramme ($1·27 per lb.)

They observed in the course of their experiments, what M. Souberain had before remarked, that the more rapidly the operation is conducted, the greater the quantity of chloroform produced. Hence the water is heated before the chloride of lime is introduced. The swelling of the mass, which is considerable in the old method, is scarcely sensible in this when conducted over a water bath and in the presence of lime, and the chloroform produced is, when the operation has been properly conducted, entirely free from chlorine. They also remark that wood-spirit, although it gives rather more product than alcohol, is not so advantageous, on account of its higher price and the disagreeable odor which it communicates to the chloroform.

Comptes Rendus de l'Acad. des Sci., Jan., 1848.

Notice of Explosions of Gas happening in Metallic Mines. By M. A. Dubree.

TRANSLATED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

The explosions of gas, unfortunately so frequent in coal mines, have not heretofore, been mentioned, at least to my knowledge, in metalliferous deposits. I therefore publish a record of several accidents of this kind which have happened in the metallic mines of Alsace.

One of these mines, that of Gundershoffen (Lower Rhine) was sunk upon a deposit of pisolithic iron ore; the bed of the ore, which is situated at the depth of 19 metres, (62⅓ yards) lies upon the marls of the upper lias. After several inflammations of the gas, without serious consequences, one occurred in 1824, which severely burned several of the miners. At Winckel, (Upper Rhine) in a deposit simi-

lar to the above, but resting upon the upper beds of the Jurassic limestone, an explosion took place in 1832, and another inflammation much less violent, on the 27th of June, 1846. Finally the gas also took fire in March, 1846, in the veins of copper pyrites worked near Giromagny.

From the circumstances mentioned in the notice, which I have the honor to present to the Academy, it appears that the inflammable gas of these iron mines, is the proto-carburet of hydrogen, which, in the two first localities emanated from certain bituminous beds of the lias and oolite upon which the deposits of Gundershoffen and Winckel rest, and rose through fissures in the works. At Giromagny the gas probably came from the transition strata which enclose the vein.

Ibid.

On the use of Gun Cotton in Blasting. By M. Combes.

TRANSLATED FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

The analysis by Pelouze of the products of combustion of gun-cotton &c., *(pyroxyle) (Comptes Rendus de l' Acad. des Sciences de Paris, 2 January,* 1847,) gave the following results:

46	volumes	of Carbonic Oxide.
1	"	Carbonic Acid.
10	"	Nitrogen.
34	"	Vapor of water.

Whence, M. Combes remarks, it follows that it does not, like good gunpowder, contain sufficient oxygen for its complete combustion, and its deflagration gives rise to a large amount of carbonic oxide, a gas both very inflammable and very poisonous. In a series of experiments, which he made under the orders of the French government upon the use of gun-cotton in blasting, he ascertained experimentally the presence of this gas by applying a light to the gases which issued from the crevices in the rock after the explosion, which he found to burn with the peculiar blue flame peculiar to carbonic oxide, and after a while to explode by the mixture of this gas with the atmospheric air. To remedy this inconvenience he mixed roughly in his hand, 100 parts by weight of gun-cotton, with 80 of chlorate of potassa, enclosed the mixture in cartridges, and charged with 900 grammes, (2 lbs.) a blast which, according to the workmen, ought to have received 3 kilogrammes (6½ lbs.) of blasting powder. The blast produced an effect at least equal to that which this much common blasting powder, or 5½ lbs. of gunpower, or its own weight of pure gun cotton would have produced, judging by the effects of the blasts upon the same rock. The gas which issued from the crevices in the rock was not inflammable, and the explosion was not accompanied by any smell, smoke, or visible vapor, while, when gun cotton alone was employed, the vapor of water was plainly visible by its condensation, and there was a faint peculiar smell. As, however, the chlorate of potassa is an expensive salt, and it is moreover to be feared, that its use when mixed with gun cotton would be dangerous, M. Combes, proceeded to experiment upon a similar

mixture of 80 parts by weight of nitrate of potassa, (common nitre) or 70 of nitrate of soda, (cubic nitre) with 100 of gun cotton. In a great number of experiments these mixtures gave constant results; entire absence of smoke and smell, as well as of inflammable gases after the explosion; and blasting effects nearly as great as were obtained with the mixture of gun cotton with chlorate of potassa; that is to say the mixture of gun cotton and nitre in the proportions indicated, produced very nearly the same effect as its own weight of gun cotton, two and three quarter times its weight of gun powder, or three and a quarter times its weight of ordinary blasting powder.

The experiments were made upon the gypsum rock, near Belleville, and analogous effects will doubtless be obtained with similar soft rocks, though nothing can be concluded from them in reference to the effects of the blasting agents upon the hard rocks.

It is to be remarked that the addition of the salts to the gun cotton does not change the volume of gases given off by the explosion of the gun cotton; there is merely a transformation of the carbonic oxide into carbonic acid, one portion of which rests combined with the base of the salt, when nitre is used, and is replaced by an equal volume of nitrogen. The increased effect obtained for the same weight of gun cotton, must be therefore due to a greater elevation of the temperature by the deflagration.—*Comptes Rendus de l'Academie des Sciences*, 17 *January*, 1848.

For the Journal of the Franklin Institute.

On the Constitution of Glycerin and the Oily Acids.

By Prof. James C. Booth.

When most of the fats are acted upon by alkali or acid, they are divided into an acid and a body called glycerin. When glycerin is distilled, or any fat containing glycerin, a peculiar body, acrolein, is produced.

Acrolein.—The formation of acrolein by the distillation of glycerin, the oxidation of the former to an acid resembling the acetic and other reactions, evidently point out the relation of these bodies to an alcohol; a conclusion which has been drawn by several chemists. On the other hand, when we examine the composition of four alcohols, methylic $C_2\ H_4\ O_2$, ethylic $C_4\ H_6\ O_2$, amylic $C_{10}\ H_{12}\ O_2$, cetylic $C_{32}\ H_{34}\ O_2$, all having the empirical general formula $C_n\ H_{n+2}\ O_2$, and compare this with a general formula of acrolein, $C_n\ H_{n-2}\ O_2$; or of glycerin, $C_n\ H_{n+2}\ O_6$, we observe a discrepancy which precludes us from classing either of the last with alcohol. Acrolein, as is well known, is obtained by the dry distillation of glycerin, or of any glyceric fat alone, or better by the distillation of glycerin with dry phosphoric acid. Its formula deduced from its analysis is $C_6\ H_4\ O_2$. By oxidation, with nitric acid, acetic and formic acids are produced by the addition of 2 eqs. water, and 4 eqs. oxygen; thus $C_6\ H_4\ O_2 + 2\ H\ O + O_4 = C_6\ H_6\ O_8 = C_4\ H_4\ O_4$ (acetic) $+ C_2\ H_2\ O_4$ (formic.) By

slower oxidation in the air, or by oxide of silver, which becomes reduced, it is converted into acrylic acid, $C_6 H_4 O_4$, which closely resembles acetic and formic acids both alone and in its salts. By slower oxidation in close vessels, acetic, formic, or acrylic acid, will result, while there is also formed disacrone; and Berzelius observes that if we abstract $C_2 H$ from 2 eqs. acrolein, there remains disacrone, $C_{12} H_8 O_4 - C_2 H = C_{10} H_7 O_4$; in which case the $C_2 H$ may be oxidized into acetic, formic or acrylic acid. Acrylic acid readily passes into acetic by the assumption of water, thus $2 (C_6 H_4 O_4) + 4 H O = 3 (C_4 H_4 O_4)$.

When acrolein is decomposed by potassa, it is first resolved into acrylate and then into acetate and formate of potassa.

We might infer from these reactions that acrolein is either a conjugate acetic acid, of which the conjugate is $C_8 H_4$, ($C_{12} H_8 O_4 = C_8 H_4 + C_4 H_4 O_4$); or it is a conjugate formic aldehyde with the same conjugate $C_4 H_2$; ($C_6 H_4 O_2 = C_4 H_2 + C_2 H_2 O_2$). But since it exhibits no properties of an acid, the latter is the more correct inference. Moreover its behavior to nitrate of silver, strengthens this view, and its classification with aldehyde, by reason of its analogous behaviour, has already received notice from Berzelius and others. If acrolein be mingled with a solution of nitrate of silver, a white caseous precipitate appears and the odor of acrolein disappears. After some moments, especially by the aid of warmth, the precipitate blackens and acrylate of silver dissolves. Since the white precipitate cannot be a compound of acrolein and oxide of silver, the inference of Berzelius is that it is hypacrylite or acrylite of silver. The latter is most probable and confirms the analogy between acrolein and aldehyde. This acrylous acid would be $C_6 H_4 O_3$. The formation of disacrone and disacrone-resin by keeping acrolein and the production of acrole-resin and alkali tend to complete the analogy between aldehyde and acrolein. The rational formula for acrolein would therefore be $C_4 H_2$, $C_2 H_2 O_2$, or a conjugate methaldehyde (formic aldehyde).

On this view the several decompositions and changes of acrolein are more satisfactorily explained. Like aldehyde it is readily converted by slow oxidation into acrylous acid, and by stronger oxidation into acrylic acid, which is formic acid, with the same conjugate; $C_6 H_4 O_4 = C_4 H_2, C_2 H_2 O_4$. By a still stronger oxidation, the action does not stop here, but the conjugate participates in it, assuming 2 eqs. oxygen, and 2 eqs. water, so that it becomes a mixture of acetic and formic acids, a successive change which is proved by the action of potassa upon acrolein.

We are acquainted with methaldehyde in another combination, the formo-methylal. When oil of vitriol and methylic alcohol are distilled, mether, or oxide of methyl, is obtained, but when the acid is dilute and oxide of manganese is added, oxidation takes place and formo-methylal results, of the composition $C_6 H_8 O_4$. From its behavior it is supposed to contain 2 eqs. mether, and 1 eq. hydrated oxide of formyl or methaldehyde; $C_6 H_8 O_4 = 2 (C_2 H_3 O) + C_2 H_2 O_2$ (*Malaguti.*) The former, mether, is formed by the separation of water, the latter by a slight oxidation of the mether. Where the oxidation is

stronger, formic mether results from the oxidation of the formic aldehyde. Moreover lignone or xylite appears to contain methaldehyde. Although we are not acquainted with the aldehyde of the formic series alone, yet we can thus trace it in combination or with a conjugate, and in the latter case we can trace it through a formous acid (acrylous) to a formic (acrylic) acid.

If we pursue the subject further we might regard acetone (mesitic alcohol) as acrylic alcohol, and the oxide of mesityl or metacetone as acrylic ether, if they be found to produce acrylic acid, as alcohol produces acetic acid. The whole series may be thus represented.

Metacetone	$C_6 H_5 O = C_4 H_2, C_2 H_3 O.$
Acetone	$C_6 H_6 O_2 = C_4 H_2, C_2 H_3 O, HO.$
Acrolein	$C_6 H_4 O_2 = C_4 H_2, C_2 H_2 O_2.$
Acrylous acid	$C_6 H_4 O_3 = C_4 H_2, C_2 H O_2, HO.$
Acrylic acid	$C_6 H_4 O_4 = C_4 H_2, C_2 H O_3, HO.$

Glycerin.—The composition of glycerin is $C_6 H_8 O_6$, in combination with sulphuric acid $C_6 H_7 O_5$, in combination with the fat acids $C_6 H_6 O_4$ or $C_3 H_3 O_2$. In some it appears to be $C_3 H_2 O$, as in anamirtin, palmitin, and laurin. The last is assumed by Berzelius to be the real base, and called by him oxide of lipyl. Admitting it to be the anhydrous base in the fats, it appears to be hydrated in some of them $C_3 H_2 O$, HO, or $C_3 H_3 O_2$, and this hydrate in others to be doubled, $C_6 H_6 O_4$. The difficulty of recombining it directly with the fat acids points to a firm union of part of the water with the base, so that we may regard the separated glycerin as different from the combined base. By distillation alone, or with phosphoric acid, glycerin loses 4 eqs. water, becoming acrolein $C_6 H_4 O_2$, and which I have shown to be formic aldehyde with the pairling $C_4 H_2$. When distilled with butyric and sulphuric acids, water is also abstracted, the base of fats produced, and butyrin regenerated. When glycerin is exposed with yeast and water to a temperature of 68° to 86°, it is converted into acetonic acid, of the formula $C_6 H_6 O_4$, so that the resulting change consists in the separation of 2 eqs. water. As it will be shown below that acetonic acid is formic acid with the conjugate $2\ C_2 H_2$, we may infer that the base of fats contains the conjugate $C_2 H_2$, making its rational formula $C_2 H_2$, CO. By the assumption of 1 eq. water, by 2 eq. of the base, 1 eq. dry acetonic acid results, $2\ (C_2 H_2, C O) + H O = C_6 H_5 O_3$. By the combustion of one half of the hydrogen in the conjugate $C_4 H_4$, it is reduced to $C_4 H_2$, which is the conjugate in acrolein. Whence we may infer that glycerin, by distillation, first loses 2 eqs. water, as such, leaving $C_6 H_6 O_4$ or $C_4 H_4, C_2 H_2 O_4$, which last body is not formic acid although isomeric with it. By the farther action of heat, 2 eqs. of oxygen in the last body abstract 2 eqs. hydrogen from the conjugate, forming $C_4 H_2, C_2 H_2 O_2 + 2\ H O$, the two former of which constitute acrolein.

Acids.—When we examine the formulas of the fat acids, we are struck with a remarkable relation between them. Butyric $C_8 H_8 O_4$, caproic $C_{12} H_{12} O_4$, margaric $C_{34} H_{34} O_4$, and all others, present differ-

ent quantities of carbon and hydrogen, for the same quantity of oxygen, but an equal proportion of carbon and hydrogen in each acid.— If we compare the alcohols, the ethers, &c., of these bodies, we find the analogy holding good between them, as is more clearly shown in the following table, where each series is named by its acid, the acids having been most thoroughly investigated. The compounds are given in the hydrated state and their empirical general formula at the top of the columns.

	ETHERS. $C_n H_{n+1} O$	ALCOHOLS. $C_n H_{n+2} O_2$	ALDEHYDES. $C_n H_n O_2$	ACIDS. $C_n H_n O_4$	BOILING POINT.
Formic	$C_2 H_3 O$	$C_2 H_4 O_2$	$C_2 H_2 O_2$	$C_2 H_2 O_4$	212°
Acetic	$C_4 H_5 O$	$C_4 H_6 O_2$	$C_4 H_4 O_2$	$C_4 H_4 O_4$	248°
Acetonic				$C_6 H_6 O_4$	
Butyric			$C_8 H_8 O_4$	$C_8 H_8 O_4$	327°
Valeric	$C_{10} H_{11} O$	$C_{10} H_{12} O_2$	$C_{10} H_{10} O_2$	$C_{10} H_{10} O_4$	387°
Caproic				$C_{12} H_{12} O_4$	396°
Enanthylic			$C_{14} H_{14} O_2$	$C_{14} H_{14} O_4$	
Caprylic				$C_{16} H_{16} O_4$	
Pelargonic				$C_{18} H_{18} O_4$	
Capric				$C_{20} H_{20} O_4$	Fusible at 64°
Cocinic				$C_{22} H_{22} O_4$	95°
Lauric				$C_{24} H_{24} O_4$	113°
Myristic				$C_{28} H_{28} O_4$	120°
Benic				$C_{30} H_{30} O_4$	126°
Cetylic / Palmitic	$C_{32} H_{33} O$	$C_{32} H_{34} O_2$	$C_{32} H_{32} O_2$	$C_{32} H_{32} O_4$	133°
Margaric				$C_{34} H_{34} O_4$	140°
Benstearic				$C_{42} H_{42} O_4$	160°

The butyric, valeric, and enanthylic aldehydes are severally known as butyral, valeral, and enanthal, but they seem to be only isomeric with those aldehydes; the formic is known only in acrolein and formomethylal. Cetylic ether is only known in composition.

When we compare the formulas of the above acids, the uniform equality in the equivalents of carbon and hydrogen is too evident to escape observation, and Dumas has endeavored to show that the radical of each acid is an exact multiple of $C_2 H_2$. But, as Berzelius observes, he is obliged to add the equivalent of basic water to support his view, for the formula of the acid in combination with a base (dry acid), always shows 1 eq. less of hydrogen than of carbon. Thus the formula of the dry butyric acid is $C_8 H_7 O_3$, that of the hydrated acid $C_8 H_8 O_4$. Hence Dumas could not apply his theory to the combined or dry acid. If we decompose these acids by distillation alone or with lime, we obtain an acetone, and by farther action, a carbohydrogen of the composition $C_2 H_2$, or an exact multiple of it.

A much simpler view of this series of acids, is to regard them as conjugates of formic acid. The formula of dry formic acid is $C_2 H O_3$, of dry acetic acid $C_4 H_3 O_3$ and by subtracting the former from

the latter we have the carbohydrogen; thus $C_4 H_3 O_3 - C_2 H O_3 = C_2 H_2$. Formic, taken from valeric, $C_{10} H_4 O_3 - C_2 H O_3 = C_8 H_8 = 4 C_2 H_2$; from margaric $C_{34} H_{33} O_3 - C_2 H O_3 = C_{32} H_{32} = 16 C_2 H_2$. The result is the same by abstracting hydrated formic acid from any of the other hydrated acids. From several of these acids, and from their alcohols, such carbohydrogens have been obtained, that of the acetic series being $C_4 H_4$, of the valeric $C_{10} H_{10}$, &c. When margaric acid is distilled, it appears that several margarones have been obtained of the composition $C_{33} H_{33} O$, $C_{34} H_{33} O$, $C_{46} H_{45} O$, $C_{68} H_{66} O$. Assuming it to be $C_{34} H_{33} O$, if we substract it from $C_{46} H_{45} O$, there remains $C_{12} H_{12}$. And in like manner Bussy's margarone $C_{68} H_{66} O$, or $C_{68} H_{67} O$ appears to be common margarone with $C_{34} H_{34}$. Moreover the oily body distilling at the same time with magarone is a polymeric $C_2 H_2$. That acetic acid may be regarded as formic acid with $C_2 H_2$ we may infer, although not assert positively, from its oxidation by periodic acid, whereby formic acid results. The olefiant gas derived from the acetic series, is generally regarded as $C_4 H_4$, but Berzelius considers it a peculiar radical, which he terms elayl, with the formula $C_2 H_2$; and its various combinations and metamorphoses are as easily, perhaps better, explicable on the supposition that it is $C_2 H_2$.

Another reason why we may consider the series of acids as being the formic paired with multiples of $C_2 H_2$, lies in the uniformly successive change of properties from the lowest to the highest. Formic, acetic, and acetonic are watery, butyric, and valeric oily, caproic, enanthylic, &c., smeary fats, laurostearic, &c., solid and firm. The odor and taste of formic and acetic are most pungent, of butyric to caprylic less odorous and pungent to the taste, the others inodorous and tasteless. The first four acids are miscible with water, valeric is soluble in 30 parts water at 54°, caproic to caprylic scarcely soluble, the rest insoluble. The boiling points from formic to valeric rise in nearly equal proportions. The fusing points from capric to margaric rise with nearly equal uniformity. The odor of formic and acetic are similar in character. Acetonic resembles the acetic closely in odor and in the properties of its compounds. Butyric has a mixed odor of butter and acetic acid.

It might be urged against this view that stearic acid appears to be a lower oxide of the same radical as margaric. Thus 2 eqs. margaric (dry) $= C_{68} H_{66} O_6$, and stearic $= C_{68} H_{66} O_5$. The composition of crystalized stearic acid is $C_{68} H_{68} O_7$, or $C_{68} H_{66} O_5 + 2 H O$, which water is replaced by 2 eqs of base. A simpler view is to consider it as composed of margaric and margarous acids; $C_{68} H_{66} O_5$, $2 H O = C_{34} H_{33} O_3$, $H O + C_{34} H_{31} O_2$, $H O$. Hence its bibasic character. The distillation of stearic acid confirms this view, whereby margaric acid and margarone chiefly result; for 2 eqs. margarous acid $C_{68} H_{66} O_4$, $2 H O$ are resolved into 1 eq. of margaric acid and 1 eq. of margarone, while water is given off; $C_{68} H_{66} O_4$, $2 H O = C_{34} H_{33} O_3$ $H O + C_{34} H_{33} O$ and $H O$. We ought therefore to obtain from 2 eqs. stearic acid, 3 eqs. margaric acid, and 1 eq. margarone which agrees well with Chevreul's results. We have other examples of a similar pairing of acids in the vaccinic, the dry acid $C_{20} H_{18} O_5 = C_{12} H_{11} O_3$

+ $C_8 H_7 O_2$ which are caproic and butyrous acids, and are convertible into caproic and butyric acids by simple oxidation in the air. Again, the relation of tartaric or racemic to formic acid, has been noticed by chemists, both in formula and behavior, and we may regard it as similarly constituted, except that one of the acids is anhydrous; $C_4 H_2 O_5$, $H O = C_2 H O_3$, $H O + C_2 H O_2$, which would be formic and dry formous acids. We may mention enanthic acid as the enanthylous acid known in its anhydrous state, although by its reactions it may be viewed as enanthylate of enanthal.

It may also be urged against these views, that some acids do not show their conjugate to be an exact multiple of $C_2 H_2$. Thus anamirtic acid is $C_{35} H_{35} O_4$, and palmitonic acid is $C_{31} H_{31} O_4$. But the former may consist of margaric and another acid not yet found; thus $C_{34} H_{31} O_4 + C_{36} H_{36} O_4 = 2 (C_{35} H_{35} O_4)$; and palmitonic may be half the sum of palmitic and benic acids.

The oxidation of the fat acids by nitric acid tends to confirm the views of their conjugate character. When stearic acid is heated by nitric acid it is readily converted into margaric acid by a simple oxidation of its margarous acid. By the action of nitric acid on margaric or oleic acid, the whole series of volatile fat acids, from capric down to formic, have been obtained. To obtain these acids from oleic, Redtenbacher employed fuming nitric acid, warmed and distilled the liquid; the residue contained sebacic, succinic, &c. acids. To obtain these last, Bromeis recommends a strong acid diluted with half its weight of water, so that we may infer that the oxidation is less violent in the last case, and that hydrogen would be mainly acted on, while in the former both hydrogen and carbon will be oxidized. The following table of the less volatile acids remaining shows this fact. I have added sebacic acid derived from the dry distillation of olein.

Empiric formula	$C_n H_{n-2} O_3$	*Acrylic.*
Succinic	$C_8 H_6 O_8 = C_4 H_2, C_4 H_4 O_8$	$= C_6 H_4 O_4 + C_2 H_2 O_4$
Adipic	$C_{12} H_{10} O_8 = C_4 H_2, C_8 H_8 O_8$	$= C_6 H_4 O_4 + C_6 H_6 O_4$
Pimelic	$C_{14} H_{12} O_8 = C_4 H_2, C_{10} H_{10} O_8$	$= C_6 H_4 O_4 + C_8 H_8 O_4$
Suberic	$C_{16} H_{14} O_8 = C_4 H_2, C_{12} H_{12} O_8$	$= C_6 H_4 O_4 + C_{10} H_{10} O_4$
Sebacic	$C_{20} H_{18} O_8 = C_4 H_2, C_{16} H_{16} O_8$	$= C_6 H_4 O_4 + C_{14} H_{14} O_4$

Succinic	$C_8 H_6 O_8 = C_2 O_4, C_6 H_6 O_4$	Formic.
Adipic	$C_{12} H_{10} O_8 = C_2 O_4, C_{10} H_{10} O_4$	Acetonic.
Pimelic	$C_{14} H_{12} O_8 = C_2 O_4, C_{12} H_{12} O_4$	Butyric.
Suberic	$C_{16} H_{14} O_8 = C_2 O_4, C_{14} H_{11} O_4$	Valeric.
Sebacic	$C_{20} H_{18} O_8 = C_2 O_4, C_{18} H_{18} O_4$	Enanthylic.

The general formula indicates 2 eqs. less of hydrogen than of carbon, from which we may infer that by a feebler oxidation, one half of the hydrogen from the conjugate $C_4 H_4$ of the fat acids is removed, leaving $C_4 H_2$, which remains united with one of the acids, in all probability with formic acid, constituting acrylic acid. Abstracting the pairling, $C_4 H_2$, we observe by the third column that the first two and last two acids may consist severally of 2 eqs. formic, acetic, acetonic,

and butyric acids. But the pimelic would leave 2 $C_5 H_5 O_4$ which obliges us to consider it as composed of formic and butyric or of acetic and acetonic. Since we have good reason for believing acrylic acid, $C_6 H_4 O_4$, to be formic acid with $C_4 H_2$, we prefer considering all the above as composed of acrylic and another of the fat acids, according to which view the fourth column is constructed. This view of the double acid constitution of the above acids sufficiently accounts for their bibasic character, 2 eqs. water being replaced by 2 eqs. base.

By examining the composition of oleic and moringic acids we find the same relation of carbon and hydrogen $C_n H_{n-2}$; for oleic = $C_{36} H_{34} O_4$, and moringic = $C_{30} H_{28} O_4$. But they form monobasic acids. By subtracting acrylic acid from them we have $C_{30} H_{30}$ for the former, and $C_{24} H_{24}$ for the latter as their pairlings. Now the behavior of oleic acid refers it to the other fat acids, from which its formula must exclude it, unless we adopt the above view. Moreover the formation of sebacic acid by the distillation of olein is readily accounted for. We may then consider the oleic acids as acrylic acid with the usual copula $C_2 H_2$ or an exact multiple of it. It may hereafter be shown that other of the fat acids, besides the formic, unite with $C_4 H_2$, so that we may have a series of acrylic acids.

Before leaving this subject the views of Millon on the above acids, probably derived from those of Mitscherlich on benzoic acid, should be noticed. I have therefore placed his formulas in the lower table, to which list he adds, oleic and moringic acids. But it may be objected against his view that the basic water is wholly left out of view and is sufficient to refute his theory. How does his view explain the fact that 2 eqs. $C O_2$ neutralize 1 eq. base in an oleate?

The view above taken of the constitution of this series of acids, certainly presents the advantage of greater simplicity, which is desirable, if consistent with facts. According to the views commonly received we must adopt two radicals in the formic series, methyl $C_2 H_3$, and formyl $C_2 H$, two at least in the alcohol series, ethyl $C_4 H_5$, and acetyl $C_4 H_3$, two in the valeric series, amyl $C_{10} H_{11}$, and valeryl $C_{10} H_9$, and thus we should have in the 17 series of the above table no less than 34 radicals, and if we should add mesityl in acetone, 51 radicals.

By adopting the above views we may employ but two radicals for the whole series, methyl $C_2 H_3$, and formyl $C_2 H$. For acetyl would be formyl with the carbohydrogen, $C_2 H + C_2 H_2 = C_4 H_3$, amyl would be formyl with 4 eqs. of the carbohydrogen, $C_2 H + C_8 H_8 = C_{10} H_9$, and so of the rest of the acids and aldehydes. Instead of ethyl we would have methyl with the carbohydrogen, $C_2 H_3 + C_2 H_2 = C_4 H_5$, instead of amyl the same with 4 eqs. of carbohydrogen, $C_2 H_3 + C_8 H_8 = C_{10} H_{11}$. In short the ether and alcohol of each series would be methylic ether and alcohol, paired with exact multiples of $C_2 H_2$. The aldehyde and acid of each series would be formic aldehyde and acid, paired with the same carbohydrogen. All the facts known in reference to the combinations and transformations of the various bodies in the above tables, as far as I have been able to obtain them, are as readily explicable on this view, as by the theories commonly adopted.

Philadelphia, March, 1848.

Description of a New Hydraulic Lifting Jack. By Mr. Ald. Thornton.

The principle of this jack is the same as that of the hydraulic press, but not having been before applied to a lifting jack, it is thought that the present application of it will be useful for a variety of purposes. Its advantages are, the ease and steadiness with which a great weight can be raised by one person; the facility with which the lowering of the weight can be regulated without labor, and from there being no circular motion of the handle, there can be no tendency in the jack to twist from the position in which it is placed; also by the use of strong wrought-iron tubes for the cylinder and ram, the weight of the jack is less than others now known. This jack can be used in all cases where others are available, and in some where others are not so, for the motion of the lever being vertical instead of lateral, it can be used wherever there is sufficient width to place it. With a jack of the size shown one man can lift from 15 to 20 tons weight. Mr. Thornton said although the jack was not new in principle, one of its great advantages was to be found in the additional power which it gave to one man to raise so great a weight.—*Proc. Insti. Mech. Engineers.*

Civ. Eng. & Arch. Jour.

On the Fitting-up of Cylinders for Locomotive Engines, and a Description of a Machine for Boring them. By Mr. C. Beyer.

The desirableness of having all the cylinders of every class of locomotive engines perfectly alike, so that they may, at any time, be changed in case of accident, or be replaced by spare ones, it is presumed will be admitted by all; the difficulty of accomplishing this with the tools hitherto employed, will be known to most who are engaged in this branch of the business. These considerations, and the defect of cylinders, the author, from time to time, found necessary to have rectified before passing them to be used, induced him, in 1843, to direct his attention to the boring-machine.

The conditions which a good cylinder boring-machine should fulfil, may be stated as follows:—1. That it should make the cylinder perfectly round in its diameter, and parallel in the direction of its axis. 2. That the bored inside should be perfectly concentive or parallel with the outside of the barrel. 3. That the projections beyond the flanches, if there be any, should be true with the internal bore. 4. That every strain or pressure upon the barrel of the cylinder whilst boring should be avoided. The boring-machine hereafter to be described has been found, during several years' practice, to have answered these conditions.

Messrs. Sharp, Brothers & Co. cast their cylinders from wood patterns in green sand, and commence the process of fitting-up by describing or gauging off a circle upon each end of the cylinder, concentive to the barrel, and having formed this circle the ends are bevelled inwards by chipping to an angle corresponding to that of the plates of the cone mandrel. The cylinder being fastened to the mandrel is put into a

two-foot slide lathe, with facing motion, and has its ends faced to a gauge, and its projections turned to a gauge, and cut to a length to gauge. There are further two notches cut out of two cone disks, so as to allow of applying an internal gauge for the out-and-out length of the cylinder. Thus prepared by turning, it is removed to the boring-machine, inserted between two plates, the faces of which are planed and the holes for receiving them bored from the boring-bar in their places; it is at once perfectly concentive with setting, and needs nothing but clamping to the plates by headed bolts or clamps by its flanches to be ready for commencing boring. For placing the tops of the steam-chests and valve facings, the turned ends are again made use of for setting, by placing upon the planing-machine table brackets placed on their faces and bored out to the same gauge; the cylinder is turned to, in order to insure the parallelism of these parts with the axis, as for similar reasons the inside of the cylinder could not be otherwise than concentive with the outside of the barrel. The author prefers making a separate set of gauges, tackling, &c. for each size of cylinders rather than economise by making one do for many, and risk the chance of mistakes; and he believes that the plan here described, to work always from the same point, is most likely to insure accuracy, as the faults made by the neglect of the workmen are not multiplied by subsequent operations.

The boring-machine bores by two cylinders at the same time, and is arranged to bore cylinders of 2' 6" stroke, and from 10 to 20 inches diameter. The bed is that of a common slide lathe, sufficiently long to carry a double set of driving gear, and admits of a sufficient traverse of the boring-carriage. The boring-bar is supported by three bearings, the former of which is stationary and firmly fastened to the bed to resist the end and pressure of the cub when boring; the latter are fixed upon the carriage and travel with it along the boring-bar, and serve for securing the cylinder during boring, as will be shown hereafter. To cause the boring-carriage to move endways, a train of wheels descends at the back of the machine to give motion to the shaft, and is transferred by means of a feathered worm to the worm-wheel and pinion, both of which move loose above the fast stud of the carriage. This same stud serves as a fulcrum for the lever, carrying upon opposite projections the intermediate pinions, which gear into the stud pinions. It will be clear, therefore, that by setting the lever in such a position as to bring one pinion into gear with another pinion fast on the rack-pinion shaft, motion will be given to the boring carriage in one direction; and in an opposite or contrary direction by moving the lever so as to bring the pinions to gear with each other; and this carriage will be stationary or independent of the driving gear altogether, by keeping the lever in its middle position. The rack pinion shaft is extended towards the front of the machine, to work the carriage by hand when putting in or taking out the cylinder. A provision is also made in the train of wheels for varying the traverse of the carriage by changing the pinion.

To hold the cylinder while boring, the top of the carriage is formed

into a kind of square frame, by means of two plates, planed on the inside and fastened to the sides of the bearings or standards and two cross stretchers. These latter are also placed upon their inner faces and are secured to the sides and top of the boring-carriage, and have holes bored in them when secured in their places, by means of the boring head upon the bar corresponding in diameter to the turned projecting ends of the cylinder to be bored. It will be seen, therefore, that if the figure of the cylinder to be bored be turned to the same gauges as the holes are bored to, it needs only inserting and clamping fast by the T bolts to be ready for boring without requiring any setting in its pan whatever. One of the cross stretchers is a fixture, whilst the other is removed every time a new cylinder is to be fixed. The boring head is a fixture upon the bar, and has only one plain square tire for boring, ground to cut either way. This tool fits into a planed recess made slightly dovetailed, and is held fast by a set screw, and easily adjustable to any diameter by another of these machines. We employ three of these machines—two double ones, and a single one, and one man attends to these and the lathe for facing and turning the ends of the rough castings of the cylinders. The cylinders are cast as hard as we are able to cut them with the best cutting tools we can make, and we find it more advisable to complete the boring in three cuts; the first is often as much as ¾ inch in depth, the second we leave about ⅛ inch, and the third can hardly be called cutting, but is merely clearing up or finishing. The advance, or traverse, we rarely change, and is set to ¼ of an inch for each revolution of the boring-bar; or is, for quickest speed of the bar, 3 revolutions per minute; in the second, 1·8 revolution per minute; in the third, or lowest speed, 1·2 revolution per minute. For boring 15 inch cylinders—for roughing out, 1·8 revolution per minute, or cut at 7 feet per minute; for boring 3 revolutions per minute, or cut at 11·78 feet per minute; and for finishing, 1·2 revolution per minute, or cut at 5·65 feet per minute. Ibid.

Description of a Perforating Machine, made for Mr. Evans, the contractor for the iron tubular bridge which is to carry the Chester, and Holyhead Railway over the river Conway. By Mr. Fothergill.

This machine is employed to perforate the plates for the above-named bridge, and is at present adapted to punch such pitches only as that work requires, viz., 3 inches and 4 inches from centre to centre of rivet holes, with latitude for departing considerably from those (general) pitches in the lateral rows of the holes. This machine is constructed to perforate, at each stroke, a row of holes across a plate 3 ft. 5 in. broad; but, by employing a series of card plates (similar to the cards used in the Jacquard loom), any number of punches may be put out of action at pleasure; and by means of a blank card at the end of the series, the machine is put out of action at a point where no obstacle is presented to the taking out of the perforated plate and putting a blank plate in its stead. The operation of changing plates, weighing six or seven hundredweight each, is performed by half a dozen men in less

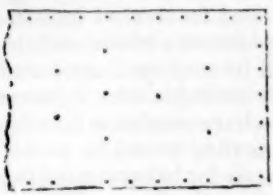
than one minute, and whilst one plate is being punched, these men get another ready to put into the machine. As these machines take eleven to twelve strokes per minute, it follows that (with a 4-inch pitch) a 12 feet plate may be punched in less than four minutes, and consequently that (allowing one minute for changing) it may perforate twelve such plates per hour. Many of the plates in the bridge are 12 feet long, 2 ft. 8 in. broad, and ¾ inch thick, and are punched for rivets 1 inch in diameter. As there are but few engineering concerns where such a perforating machine as that at Conway could be employed more than an hour or two per day, it appears to be very desirable that ironmasters should have them, and that they should also have machines for straightening and bending plates; by which means they would be enabled to supply their customers with plates in a fit state for being riveted together. Were this system brought into practice, engineers would turn their attention to adapt their work to the capabilities of the perforating machine, and thus great perfection, despatch, and economy of construction would be the result. A drawing represented a machine (similar in principle to that already described) adapted to perforating paper and thin sheet metal, such as sieves and window-blinds are made of, in which plain perforations, arranged in squares, may be made by a single row of punches; and perforations arranged quincuncially, may also be made by a single row of punches, by giving to the plate a lateral alternating motion; but a double row of punches, arranged intermediately to each other, is preferable. Each of these arrangements admits of a great variety of fancy patterns by the application of the Jacquard principles. A large class of patterns may be produced by punches of various forms and sizes, which shall be so grouped together as to give to the work a columnar effect; and the range of this class may be extended by giving the plate a zig-zag or waved motion, and still further extended by combining it with the Jacquard. Another class of patterns may be produced by employing two distinct sets of punches of different size or form, and with each set a Jacquard, to bring punches of the one or other set into action as required, and thus be made to produce representations of figures, landscapes, &c., at pleasure. A further variety of patterns might be produced by the introduction at intervals of punches containing set patterns, such as sprigs, flowers, &c., and perforating the ground with small punches.

The foregoing is but a brief description of the capabilities of the Jacquard Perforating Machine, which in good hands would be found to be nearly co-extensive with those of the Jacquard loom. Another drawing represented a double-acting machine for shearing (at the one side) and punching (on the other) at the same time, plates of iron ¾ inch in thickness with holes 1½ in. in diameter, and to perform both processes to the extent of 18 inches from the edge of the plate.

In order to give an idea of the nature of the work to be performed by this machine, we subjoin the annexed diagram and description, taken from the *Manchester Guardian*:—

"The diagram represents a portion of a wrought-iron plate, which we will assume to be, when entire, 12 feet long by 2 feet wide, and

¾ inch in thickness, and requiring to be perforated, along each side and end by a row of holes *exactly* four inches asunder from centre to centre, and each an inch in diameter; as well as by certain intermediate holes of the same size, the situation of which will be best understood from the diagrams.



"On looking to the left hand of the diagram representing the entire end of the plate, it will be seen that there is vertically a row of seven dots, representing seven perforations or rivet-holes. These perforations the machine makes at one moment, by bringing down with immense force seven punches of tempered steel, upon that part of the plate which at the time rests upon the same number of dies, also of tempered steel. These perforations being made, the punches are lifted clear of the plate, which is then moved forward longitudinally, exactly four inches; and then the striking peculiarity of the machine comes into play.

"It will be seen on looking carefully at the diagram, that the second row vertically of perforations, counting from left to right, instead of seven contains only two, one at the upper and the other at the lower margin, each forming a part of the two side rows of rivet-holes. These two holes the machine perforates also at one blow; but as there are seven punches, and only two are required, the five intermediate ones are thrown out of use by a contrivance exactly similar in principle to that of the Jacquard loom, by which figures are produced in silks and other fabrics. The third vertical row of holes, still continuing from the left, consists of four, the fourth again of two, the fifth of three, and so on, the number varying through the whole length of the plate; and, in each case, the machine itself, without the slightest interference of the workman, moves the plate on to the required distance, selects the proper number and right situation of the punches, makes the requisite number of perforations, and throws itself out of action when the plate is completed. Those who are aware of the force necessary to perforate an iron plate of moderate thickness, even with a single punch of small size, may form some judgment of the enormous power required to impel seven punches, each an inch in diameter, through plates three-quarters of an inch thick; and it is a little singular to see this enormous power regulated in its operation by the identical means employed in producing figures in the most delicate fabrics. The machine is calculated to make, when necessary *twelve* perforations by one stroke, and to produce any requisite combination of twelve or any smaller number of punches, at distances of three or four inches from each other. The speed with which the work is performed may be understood from the fact, that it regularly completes the perforation of one plate of the size above described,—namely, 12 feet long and 2 ft. 4 in. wide,—in four minutes; and if the plates were so quickly supplied as to prevent any loss of time, which might easily be done, it would complete them regu-

larly at that rate. As it is, fifty have been completed in four hours. But the facility and dispatch resulting from the use of the machine are not, perhaps, its greatest merits, so far at least as the construction of tubular bridges and beams are concerned. In such cases, the strength of the fabric depends in a great degree upon the whole of the rivets completely filling the perforations, retaining a regular cylindrical form, continuing perfectly straight, and being, throughout their length, exactly at right angles with the faces of the plates. As each of the perforations represented in the diagram is intended to correspond with a similar perforation, either in another plate, or in an angle or T iron, it must be obvious that deviations in opposite directions of a sixteenth of an inch in each, would prevent them fitting each other by an eight of an inch altogether; and, whatever might be done by enlarging one or both of the holes, to bring them a little nearer each other, the firmness and strength of the work must be impaired by the direction of the rivet being rendered in some degree oblique, instead of being exactly at right angles with the plate; whilst, in the work performed by the machine, the perforations are set out with such accuracy that they always correspond precisely, and the rivets retain their proper form and direction."

Ibid.

Description of a Glass-Blowing Apparatus, being a new invention in the Blowing of Glass. By Mr. Wm. Cooper.

This invention consists in effecting the blowing of glass by means of double bellows placed under the floor, acted on by the foot of the glass-blower, and the air is carried to the blow-tube by means of a flexible tube, easily attached and detached from the nozzle of the ordinary iron tube. The advantages are stated to be, that larger articles can be blown, that the glass is freer from "cockle," and that the lungs of the workman are saved, and his muscular energies not being so severely taxed, he will be able to produce a great deal more manufactured goods in a given time. The air blown by the bellows being of a much purer quality than that from the lungs, produces a better article. That larger sizes and a thicker substance of blown plate may be obtained by this new process, and the sheet-glass manufacturer will be able to compete with the cast plate-glass monopolist. That "carboys" to contain twelve and sixteen gallons have been successfully blown by this process. Mr. Cooper then recommended that this process should be adopted in Edinburgh and Leith, where coal is cheaper than in Staffordshire by 4*s.* per ton, and where living and house-rent are about one-fourth less; the workmen all preferring Leith, from its healthy situation, cheapness, and family conveniences. Locality, he stated, is now looked at; economy in carriage is itself a profit to the manufacturer, now that the duties are removed, and all the English manufacturers circumscribing their connexion.

Proc. Roy. Scottish Soc. Arts.—Ibid.

Accident from the Bursting of a Boiler at Manchester, causing the Loss of Life.

Our Manchester correspondent, writing yesterday afternoon, informs us of a dreadful accident, which has occurred in that town, from the bursting of a boiler at the manufactory of Mr. Thomas Riley, spindle and flymaker, Medlock-street, Ardwick. The catastrophe occurred about half-past eight o'clock yesterday morning, and eight human beings, varying from 20 to 30 years of age, were sent to their last account, without a moment's warning. Five of the unfortunates were workpeople, in the employ of Riley, the owner of the boiler. Two children, belonged to a butcher, named Wardsworth, resident in the neighbourhood; and another was the child of a blacksmith, whose forge was in the same yard as Riley's manufactory, and which was also completely destroyed. There were others seriously hurt, and they lie at the Manchester Infirmary in a dangerous state. It was currently reported in the neighbourhood of the accident, that the boiler has been considered in a dangerous condition for some time past, and that people have refused to work at the manufactory in consequence. It was, therefore, thought proper to take Riley into custody. Another thing which tells against him is, that the person whom he employed to take charge of the engine, was a boy, only 15 years of age. This boy's name was Joseph Atkinson, and he was killed. The accident has, of course, caused great excitement in Manchester, and the inquest, which will, doubtless, be held this day (Saturday), is looked forward to with great anxiety. Min. Jour.

The late Fatal Boiler Explosion at Manchester—Verdict of Manslaughter against the Owner.—The inquest arising out of the fatal boiler explosion at Manchester on Friday last, was adjourned from Saturday to Wednesday afternoon. There were nine dead when the jury was summoned on Saturday, but since that time three others have been added to the victims already mentioned. The evidence adduced was of a very voluminous character, and tended to show that the boiler was unsafe; and that Mr. Riley, the owner, had been frequently warned of that fact. After hearing all the evidence, the jury unanimously returned a verdict of "manslaughter" against Mr. Riley. Ibid.

Experiments on the Strength of Materials. By Geo. Rennie, Esq.

In consequence of the numerous accidents that are daily occurring through the failure of structures on the lines of railway which now intersect the country in all directions, every experiment or remark however trivial, respecting the strength of materials, must be looked upon by the practical engineer as subjects of the greatest importance; and the more especially so, when such remarks are made by men, who have long been advantageously known to the world for their skill and dexterity in the performance of experiments of this sort, as well as for the accuracy and attention with which their results have

been registered and applied to practice. Amongst the list of individuals here alluded to, George Rennie, Esq., holds a distinguished place: he took the lead of the experimentalists in this country and his results have always been received with the greatest confidence in important erections, not only for the skilful selection of the forms and specimens which he has employed, but also for the great care and attention with which the results were obtained and accommodated to practical purposes.

Since the singular and unexpected failure of one of the large girders in the Dee Bridge, on the Chester and Holyhead Railway, a great many useful and interesting experiments have been made, and numerous inferences have been drawn for the purpose of determining the strongest form of girder for railway bridges, and numerous papers have been published in the journals, drawn up by men, who with consummate scientific knowledge, combine the most extensive practical experience; and the result has been, that forms have been elicited, differing very considerably from those which had previously been considered as the best; and it is to be hoped, that by continuing the experiments with the some degree of ardour, the best of all possible forms will ultimately be detected, which will doubtless be the means of preventing so many frightful and fatal accidents as have lately been recorded in the public prints.

Amongst the publications that have lately issued from the press, containing much useful information on subjects of this nature, is an Architect's Pocket Book for 1848, by Messrs. John Williams & Co. of the Strand, London, in which are recorded a series of experiments performed by the eminent individual above named, so far back as 1817, and subsequently, but have never before been published; and since the subject is one of such very great importance in a practical point of view, we avail ourselves of the publishers' permission, to transfer the following material portions of the series to our pages.

Taking the Series as registered by the experimentalist, we have Series No. 1, on the Transverse Strength of Wooden Beams resting on rollers, 3 feet 9 inches apart.

Species of timber.	Sectional dimens.	Breaking Weight	Species of timber.	Sectional dimens.	Breaking Weight.
	in. in.	lbs.		In. in.	lbs.
English Oak .	2×2	1369	English Oak .	1+1	160
Ditto . .	"	1456	Ditto .	"	168
African Oak .	"	1425	Ditto .	"	193
Ditto . .	"	1447	African Oak .	"	202
Ditto . .	"	1873	Ditto .	"	224
Ditto . .	"	1968	Ditto .	"	224
Yellow Dantzig Fir	"	999	Yellow Dantzig Fir	"	118

Series No. 2.—On the Tensile Strength of various Timbers per Square Inch.

	lbs.		lbs.
Ash .	12,000	White Deal .	10,000
Beech . .	10,500	American Oak	12,200
Elm . .	10,000	English Oak .	12,000 to 10,500
Yellow Fir .	9,600	Riga Oak .	12,000
		African Oak .	14,000 to 15,000

Series No. 3.—On the Tensile Strength of different kinds of Metals one quarter of an inch square.

	Tensile force in lbs.	Force in tons pr. square inch
Cast iron, horizontal	1166	8.0*
Cast iron, vertical	1218	
Cast steel, tilted	8391	59.94
Blister steel, reduced per hammer	8322	59.44
Shear do. do.	7977	52.50
Swedish iron, do.	4504	32.17
English do. do.	3492	24.94
Brass-hard gun metal, two trials	2273	16.23
Wrought Copper, reduced per hammer	2112	15.08
Cast Copper	1192	8.06
Fine yellow brass	1123	8 00
Cast tin	296	1.60
Cast lead	114	0.81

Series No. 4.—On the Transverse Strength of Cast Iron Beams, for the purpose of determining the effect of Wrought Iron, when mixed with Cold Blast Blaenarvon Cast Iron in different proportions.

No. 1. Quality of iron, No. 1, Blaenarvon (unmixed with wrought iron,) 4 feet 6 inches between supports, and 1 inch square.

Three bars experimented upon, the average weight of each being 16lbs. 5 oz.

Average deflection with 506 lbs. in scale=1.76 inches, and breaking weight, 511 lbs.

No. 2. Three bars of similar dimensions to the above, mixed with 10 per cent. of wrought iron, and weighing, upon an average, 16 lbs. 9 oz.

With a weight of 511 lbs. deflected 1.50 inches, and broke with a weight of 625 lbs.

No. 3. Three bars of similar dimensions to the above, mixed with 20 per cent. of wrought iron, and weighing, upon an average, 16 lbs. 10 oz. each.

With 628 lbs. in the scale, deflected 1.58 inches, and broke with a weight of 726 lbs.

The results are, that 10 per cent. wrought iron, with No. 1 *Blaenarvon* Cast Iron, gives an additional strength of 22½ per cent., and with 20 per cent. wrought iron, an additional strength of 31½ per cent.

Similar Experiments were made with bars of Blaenarvon Cast Iron, mixed with 30, 40, and 50 per cent. of Wrought Iron respectively—the results of which were:

For 30 per cent. of wrought iron, an increase in the strength of the bar	60 per cent.
For 40 per cent. of wrought iron, an increase of	33 "
And for 50	26½ "

* These were unusually strong specimens, but the average of subsequent Experiments on various irons does not give more than 6½ tons per square inch.

From which it appears, that 30 per cent. of wrought iron, mixed with Blaenarvon, gives the greatest strength.

Series No. 5.—On the Comparative Strength of similar bars of Blaenarvon Cold Blast Iron in different positions, 1 inch square.

No. 1.—In the form of an arch, 4 feet 6 inches between the abutments; rise or versed sine $\frac{1}{12}$ of chord or span, bore 1267lbs.

No. 2.—A bar similar in every respect, but the arch inverted bore 357lbs. and was therefore 3½ times weaker than the former arched beam.

No. 3.—The same with versed sine $\frac{1}{8}$ of chord or span, bore for the mean of 2 experiments—from whence it appears that the bar in this last position was 3.6 times stronger than the straight bar, and 5 times stronger than the bar in the form of an inverted arch of $\frac{1}{12}$ rise 1729lbs.

No. 4.—Same as above, but reversed 280lbs.

Series No. 6.—On the Transverse Strength of Bars of Blaenarvon Iron, Nos. of different Depths and Thickness, but of equal Weight with Bars of 1 inch square, or from 16 lbs. to 17 lbs. each.

	Distance between supports. ft.	in.	Weight of Bar.	Depth. inch.	Thickness. inch.	Breaking Weight. lbs.
Rectangular . .	4	6	16½	2	½	1121
Do. . . .	4	6	16 9/16	3	⅓	1568
Do. . . .	4	6	17	4	¼	2352
Upper side Parabolic	4	6	11	2	½	953
Do. Parabolical Semi-elliptical	4	6	11	3	⅓	1429
Do. Semi-Elliptical .	4	6	12	2	½	950
	4	6	12	3	⅓	1440

N. B.—The force required to crush a cubic inch of Cast Iron is 70 tons. The permanent deflexion varies from ⅓ to ½ of the breaking weight.

In addition to these experiments, we take the liberty of transcribing the following Practical Solution of Problems, for calculating the Strength of Materials, the experimental data for which will be found under the words Tension, or Pressure, in the Table of Specific Gravities, published in the Pocket Book.

Direct Cohesion.

What weight will be required to tear asunder a piece of oak timber, the scantling of which is 4″×4″?

Suppose 11,000 for tensile strength in lbs. for English oak; in this scantling we have 4″×4″=16″; therefore—

$11.000 \times 16 = 176{,}000$ for utmost tensile strength; in practice one-fourth of this is taken:

$$\frac{176{,}000}{4} = 44{,}000.$$

The weight being given, and the area of section required, divide the weight by the tabular number; as required the scantling of fir for

supporting a hanging weight of 30,000, multiplying by 4 we have 120,000 and the tabular number of fir is 9,000; by which divide, and we get 13″·33 for sectional area, and the square root of this is the side of the fir scantling required;=3″·65.

Transverse Strength.

Required the weight a beam of red pine, of 9″×22″ scantling and 25 ft. long would bear, applied in the middle of the beam; multiplied continuously the "Constant of Strength" by 4, by depth, by sectional area, all in inches, and divide by the length of bearing in inches, or in this case—

$$\frac{1341\times4\times12\times108}{300}=69517,$$ and ⅓ of this, or 17379,

would be the weight applied in practice; and if the weight is to be distributed over the beam, it will bear double the weight.

The weight, the bearing, or distance between the points of support, and depth of the timber being given, required the width it will then be; as weight 20 tons, length of bearing 20 ft. (or 1 ton per foot), depth of oak timber 20 ft.—

20 tons=44,800 lbs.
20 feet=240 in.

and constant for oak 1180; then we have

$$\frac{44800\times240\times4}{1180\times4\times20\times20}=20''.66,$$ one half of which

would be sufficient, if the weight is to be equally distributed throughout.

It is not unusual to consider the strength of oak as equal to one-fourth of that of cast iron, and that of yellow fir as 0·3 of cast iron.

With regard to cast iron girders, the area in feet of the floor is multiplied by 240, and the product in pounds is considered the weight to be provided for; the area of the bottom flange is made equal to half the sectional area of the whole beam; the area of the top flange to be equal to one-sixth of the bottom flange; the remainder will give the area of the web between the flanges. Supposing the bottom flange to be 18″×2″=36″ the top flange would be 6″ in area; 36″ ×2″=72″=sectional area of beam, and 72″—42″=30″ for area of web between the flanges. London Artizan.

Calorific Action of an Electric Current. (Extract from a letter from M. Plücker to M. Arago.)

Translated for the Journal of the Franklin Institute.

"An air-thermometer placed between the two poles of a strong magnet rises exactly as though the temperature had augmented. *The air is dilated by magnetism as it is by heat.* In order that the experiment may succeed well, the poles of the magnet must be fixed as closely as possible together, and the reservoir of the thermometer must have a form corresponding to that of the poles of the magnet, taking care that it cannot be compressed by these poles when they

become magnetic. The temperature of my air-thermometer having become constant, I closed it by a small drop of alcohol in a glass tube of 1 mm. bore (·04 inch). When the magnetism was excited by a Grove's battery of 12 elements, the drop of alcohol was seen to be repelled outwards about 3 mm. (·12 in.) and to return even more rapidly to its former position upon the interruption of the current."

Comptes Rendus de l'Acad. des Sciences, Feb. 7th, 1848, p. 227.

Experiment with the Electric Telegraph.

Translated for the Journal of the Franklin Institute.

M. Dujardin of Lille, communicated to the Academy, the result of an experiment upon Electric telegraphing which he performed between Lille and Amiens, on the 25th January last. The telegraph was worked without a battery, by means of a magneto-electrical machine with vibrating armature, composed of three magnets. The experiment succeeded completely. During the course of the experiments, which lasted an hour and a half, but one of the magnets was employed, the whole power of the machine having been found much too great. **Ibid. 14th Feb., p. 239.**

On the Colored Photographic Image of the Solar Spectrum. By M. Edmond Becquerel.

The author in the course of his researches upon the chemical action of light was led to this remarkable fact, that the solar spectrum could form its image with colors corresponding to its own, upon a plate of silver properly prepared. For this purpose the plate may be attacked by free chlorine with the precautions indicated in the note presented to the Academy: the sensitive coating which is formed upon the surface of the plate, is red in the prismatic red, yellow in the yellow, green in the green, blue in the blue, and violet in the violet. The reddish tint turns to purple in the extreme red, and extends even beyond Fraünhofer's line A; as to the violet it continues far beyond A, gradually becoming more feeble. When the action of the spectrum is permitted to last a long time, the tints become dark, and the image finally takes the metallic lustre; the colors have then disappeared.

According to the preparation of the plate and the thickness of the sensitive coating, any one of the tints of the spectrum may be made to predominate; thus a surface well prepared and previously in diffused light colored purple under a deep red glass, gives a beautiful colored photographic image of the spectrum, in which the orange, yellow, the green, and the blue, are marked with the greatness clearness. The substance formed upon the surface of the silver is not the white chloride but probably a sub-chloride, since it is not strongly colored beyond the visible violet, as the chemically precipitated chloride is, and the maximum of action is found in the yellow, where the maximum of luminous intensity is, or moves towards the red, according to the preparation to the plate. To get a tolerably rapid action, it is neces-

sary to use a strongly concentrated spectrum. These effects explain the red color of the chloride of silver, and of the sensitive paper formed with that compound, in the red rays, which has been already observed by MM. Seebeck and Herschel.

The author has succeeded in preparing by means of free chlorine, and also by using bichloride of copper, a sensitive coating of the chloride of silver so impressed that now only certain parts of the spectrum are represented with their colors, but besides, white light makes a white impression.

The compound formed upon the surface of the silver, by the action of chlorine, is the only one hitherto found which shows the properties here mentioned. Up to the present time, it appears necessary to keep the colored prismatic image in the dark, and the author has not found the means of fixing it under the influence of light. If the fixation could be accomplished, and if the sensitiveness of the material was greater, we could not only draw but also paint by light; nevertheless the results mentioned show that the solution of the problem is possible. Ibid, 7th Feb., 1848, p. 181.

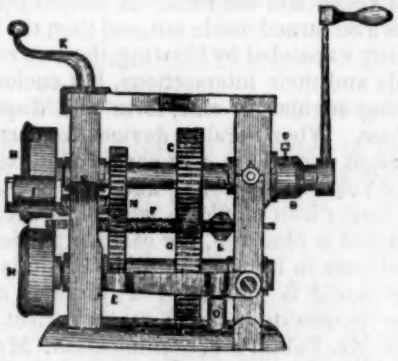
New Liquid for Lamps.

In a letter from M. Louyet, of Brussels, read to the Academy of Sciences of Paris, by M. Pelouze, he states that he has satisfied himself by experiment that the essential oil obtained by the distillation of common resin, when burned in the camphene lamp equals if it does not surpass the camphene itself. He does not say whether in light or in smoke. But the fact reminds us of similar experiments made in this city some years ago by one of our most distinguished chemists for the purpose of ascertaining whether certain products obtained by the distillation of gas tar could not be substituted for camphene. It was found that the substance burned beautifully, the only drawback being, that nobody could stay in the room with it owing to the smell. M. Louyet attributes the invention of the lamp for burning camphene to the English under the name of the Vesta Lamp. The Vesta Lamp was nothing more than the ordinary camphene lamp which had been used and patented in this country years before.

Description of an improved Wiring Machine for the manufacture of Tin, Sheet-Iron, and other Plate Ware, Patented by A. W. Whitney, Woodstock, Vermont, 1847.

The face plates or rolls H H, are made of cast-steel of an improved form having the journal boxes of their shafts in a cast-iron frame. This frame consists of two pieces, fitted together at A, and at the top of the upright piece under K. The journal box A has two projecting ears or bearings, (one of which is seen at A,) at right angles to the shaft B H, on which ears it is supported, forming a fulcrum to the shaft BH; thus preserving the bearing of the shaft A perfect, while the end H is raised and depressed in the process of working. B is a movable

collar for adjusting the shaft and rolls longitudinally, with great nicety. C is a binding screw, for keeping the collar in place. In the shaft concealed by the collar B, is a spiral groove, into which the binding screw enters. Thus, by turning the collar on the shaft, a nice longitudinal adjustment can readily be obtained. The movement of the rolls H H, is secured in the usual manner by the connecting gearing G G. F is a gauge extending between the rolls, with a spring F, and a thumb nut L, for adjustment. I is a forming gauge, consisting of a friction roll, attached to the side of a short rod or shaft, and having its journal bearing in the frame. On the inner end of this shaft is a ratchet wheel N, for placing the gauge in any desired position. Fitted to the ratchet is a latch E for holding it in place. At D is a spring, pressing the latch into the teeth of the ratchet.



In the working of the machine, the bearing at A always remains perfect; for its journal box, by turning on its ears, accommodates itself to the shaft in all positions. Again, the inclination of the shaft B H is always towards H, so as to bring the collar B in contact with the box. Now, to compensate for any wear which may displace the rolls H H, as well as to adjust them to different kinds of work, the collar B is always immediately adequate.

It will readily be seen that the above improvements secure advantages, not possessed by any former construction, rendering the machine susceptible of immediate adaptation to plates of different thickness.

The above improvements are applied to other machines.

On the Curiosities of Glass Manufacture. By Mr. A. Pellatt.

This communication would have been made on the Friday before, but for an alarm of fire in the Theatre of the Institution. On the present evening, as it was not considered prudent to re-erect the furnace which had caused the apprehension, Mr. Pellatt explained the various processes by diagrams, models, and working instruments. Of these processes we can give but a brief outline. It was noticed that in ancient, as in modern glass, sand was the base, and alkali the solvent,

and the injury occasioned to the glass by an excess of the latter ingre, dient was pointed out. That opacity of glass, called *devitrification* was explained as consisting in the formation of a multitude of minute crystals in close contact with each other on the surface of the glass. The process of annealing was then described; and it was shown that a glass tube forty inches in length contracts if annealed, a quarter of an inch, while an unannealed tube of the same length contracts but one eighth of an inch. The most interesting part of Mr. Pellatt's discourse referred to the mode of making *Vitro di Trino*, and of impressing heraldic devices, &c., on glass. In the case of Vitro di Trino, the gathered glass, after being expanded into a bulb or eylinder of the required size, has rods of other glass or enamel attached to it in a vertical position, at equal distances all round, and then, the bottom being held, the top part is more or less turned, so as to give an equally inclined twist to the vessel and the rods. A similar but larger vessel is made, but which is also turned inside out, and then the former is put into the lathe; and, being expanded by blowing, the two come together and adhere by the rods and their intersections, but enclose small portions of air, which, being regular in size, form and disposition, give the character of the glass. When heraldic devices, &c., are to be impressed, a mould of the design is made in a fit earthy material, (being puzzolana or one of the volcanic deposits,) and this is placed within, and forms part of the larger iron mould in which the decanter is blown—when the large mould is removed, the earthen portion still adheres to the glass, and continues in its place until the bottle is finished. After the annealing, the mould is moistened with water, and immediately separates, and the impression is found really perfect.

At the close of Mr. Pellatt's communication, Mr. Faraday called the attention of the members to two circumstances of philosophical interest, which had happened during the momentary apprehension of fire to which we have alluded.—1. At three different times the water poured on the cinders of the temporary furnace, when, on the fire being drawn, they fell on the hearth, became decomposed by the ignited carbon; and the hydrogen, driven by the sudden expansion of steam, &c., having penetrated the hot and porous hearth stone, found its way to the heated beams and space which were immediately beneath.—2. This gas, though not in the state of flame as it passed through the hearth-stone and pugging, was, after being mixed with the air below, sufficiently hot to enter into combustion,—producing three gushes of flame downwards from beneath the hearth:—and it was experimentally shown that a temperature so low as barely to scorch paper, and in which the hand may be held for some seconds without inconvenience, is yet able to ignite a jet of coal or hydrogen gas in air.—*Proc. Roy. Inst.* Athenæum.

Origin of the Plague.

In ancient Egypt the plague was unknown. Although densely populated, the health of the inhabitants was preserved by strict atten-

tion to sanitary regulations. But with time came on change—and that change was in man. The serene climate, the enriching river, the fruitful soil remained; but when the experience of 2000 years was set at nought,—when the precautions previously adopted for preserving the soil from accumulated impurities were neglected,—when the sepulchral rites of civilized Egypt were exchanged for the modern but barbarous practices of interment,—when the land of mummies became, as it now is, one vast charnel-house—the seed which was sown brought forth its bitter fruit, and from dangerous innovations came the most deadly pestilence. The plague first appeared in Egypt in the year 542, two hundred years after the change had been made from the ancient to the modern mode of sepulture; and every one at all acquainted with the actual condition of Egypt, will at once recognize in the soil, more than sufficient to account for the dreadful malady which constantly afflicts the people.—*Mr. Walker on the Metropolitan Grave Yards.* Ibid.

On the Electro-Bronzing of Metals.

MM. Brunel, Bessin, and Gaugin presented to the *Academie des Sciences*, at Paris, specimens of metals bronzed by electro chemical means. M. de Ruolz, in 1841, communicated to the academy a process for bronzing metals, by depositing upon them, by the aid of the galvanic battery, layers, more or less thick, of brass or of bronze. This process, which required the employment of the double alkaline cyanides of copper and zinc, or of copper and tin, was not adopted in practice, on account of the great expense of the cyanides, and for other reasons. MM. Brunel, Bessin, and Gaugin, have substituted for the cyanides, a solution in water, of 500 parts of carbonate of potash; 23 chloride of copper; 40 sulphate of zinc; and 250 nitrate of ammonia. To produce bronze, a salt of tin is substituted for the sulphate of zinc. By means of these solutions of brass or of bronze, a coating can be given to cast or wrought-iron, steel, lead, zinc, tin, and alloys of these metals, with one another, or with bismuth and antimony, after a previous cleaning according to the nature of the metal. The operation is conducted with a cold solution. The metal to be coated is placed in connexion with the negative pole of a Bunsen battery, a plate of brass or of bronze being employed at the positive pole. When the objects have been covered with a coating of the metal desired, and have received their proper color, they will be found to rival the finest bronze. Civ. Eng. & Arc. Jour.

Sulphate of Iron for Purifying Gas.

M. Marens, of the University of Louvain, has made a discovery in the use of sulphate of iron for the purification of coal gas. By this arrangement, the gas passes through two purifiers: in the first is placed 1 cwt. of sulphate of iron, dissolved in 83 gallons of water, and in the second milk of lime, made by adding 83 gallons of lime to

375 gallons of water. On passing from the second purifier, the gas is almost completely deprived of its sulphuretted hydrogen, that it scarcely changes the color of paper moistened with a solution of oxalate of lead. By this process, there is a greater deposit of tar in the solution than when water alone is employed; and there is a much more abundant condensation of aqueous and ammoniacal vapors—so that during long-continued frosts, the pipes have been kept entirely free from ice, which causes considerable trouble and expense. The cause of tar depositing in a ferruginous solution more readily than in water, arises from the sulphate of iron having a greater affinity for the tar, which it condenses, and carries down with it; and the greater condensation of vapors contained in the gas is caused by a more complete absorption of ammonia, which always has a tendency to mix with other vapors. The above quantity of sulphate of iron is sufficient for purifying the gas from 25 to 27 tons of coal; the solution is then so impregnated to saturation, as to require changing. It is probable the residue of this plan may become a valuable article of commerce.

Ibid.

New Method of Treating the Ore of Platinum.

Instead of the tedious operation of obtaining pure platinum from the ore, employing 8 or 10 parts of acid to one of platinum, M. Hess suggests the following as an improvement:—Melt one part of platinum ore with two or three of zinc, which will form an alloy very friable, and easily reduced to a fine powder. This powder is then to be sifted, and on it poured dilute sulphuric acid at the common temperature of the atmosphere. The temperature is then gradually raised, and the metals allowed to macerate as long as there is anything to dissolve; the acid in a short time separates all the zinc from the alloy, and the principal part of the iron contained in the ore. A solution is obtained in which hydrosulphuric acid produces no precipitate. Having poured off the liquid, the residue is a fine powder, which, having been well washed, is treated with nitric acid, which dissolves the copper, and other foreign metals; the platinum is then dissolved in nitro-chloric acid, and then proceeded with in the usual way. Ibid.

Friction Hammer.

A novel machine, just completed, is now at work at the Great Western Works, at Bristol, the invention of Mr. John Jones, manager of the works, who also invented the "Cambrian Engine." The machine is called a "Friction Hammer," and consists of frames of cast-iron, in which are vertical slides acting as guides to the hammer, and also supporting the machinery necessary for putting the hammer in motion. The hammer consists of a plain bar of flat wrought-iron, so arranged as to work in the slides, and is raised by means of two

vertical rollers turning in opposite directions, which are made to bear upon the bar by an exceedingly simple arrangement of levers. A slight pressure upon the handle of one lever raises the hammer to any height not exceeding 7 feet; the pressure being removed it falls by its own gravity; this lever is also arranged so as to stop the hammer in any part of its descent, should circumstances render it necessary. The friction rollers are put in motion by means of straps and pulleys, fly-wheels being also fitted on each strap. Ibid.

BIBLIOGRAPHICAL NOTICE.

Principles of the Mechanics of Machinery and Engineering, by Julius Weisbach, *Professor of Mechanics and Applied Mathematics, in the Royal Mining Academy of Freiburg. First American Edition. Edited by Walter R. Johnson, A. M., Civil and Mining Engineer. In two volumes; illustrated with* 1000 *engravings on wood. Vol.* 1.—*Theoretical Mechanics. Philadelphia: Lea & Blanchard,* 1848.

(Forming the 2d volume of the Library of Illustrated Scientific Books.)

In our notice of the first publication of this series, Müller's Physics, we ventured to express the hope that the succeeding volumes would be more worthy of the pains bestowed upon their getting-up; and we are gratified to find that our hope was not a vain one. The work, whose title is given above, appears to us, from the hasty examination which we have been able to give it, in every way worthy of being recommended to our readers. It is, as its title professes, a treatise on Mechanics, in especial reference to its applications to Machinery and Engineering. The divisions of the subject are very well arranged, and appear to be treated of in a very masterly manner. We fear, however, that the mathematical character of the book, and the sometimes complicated appearance of its formulæ, may detract from the popularity which it deserves. If the numerous and beautiful illustrations with which it abounds prevent this from being the fact, it will produce the very desirable effect of familiarizing our mechanics with mathematical notation, and thus the book will do a double benefit to science.

We have not had time, since the book was laid upon our table, to give it the attentive study which a work of this kind requires, and which this appears so well to deserve. This we purpose to do hereafter. In the meantime, a cursory examination of it, authorizes us to recommend it to students of the science of which it treats, as the production of a gentleman thoroughly competent to the task which he has undertaken.

The additions and remarks, by the American editor, are judicious and excellent, and the wood-cuts are decidedly the finest specimens of illustration of this kind that we have ever seen. We hope soon to see the second volume. F.

FRANKLIN INSTITUTE.

Proceedings of the Stated Meeting, held April 20th, 1848.

S. V. MERRICK, President, presiding.

Present, 44 Members.

The following donations were announced:

From Hon. Jno. W. Farrelly, M. C., Washington City, D. C.—
The President's Message at the commencement of the 1st Session, 30th Congress.

From Hon. T. O. Edwards, M. C., Washington City, D. C.—
The President's Message at the commencement of the 1st Session, 30th Congress.

From the Royal Astronomical Society of London—
Their proceedings for January 14th, 1848.

From the Apprentices Library Company, of Philadelphia—
Their Annual Report for the year 1847.

From Hon. Edmund Burke, Com. of Patents, Washington City, D. C.—
Catalogue of the Library of the Patent Office, 1847.

From Hon. William Jackson, Massachusetts—
Annual Reports of the Railroad Corporations of the State of Massachusetts, for 1847—Legislative Document, No. 26.

From Messrs. Lea & Blanchard, Philadelphia—
Principles of the Mechanics of Machinery and Engineering, by Julius Weisbach, 1st Am. ed., vol. 1—1848.

From Richard C. Taylor, Esq., Philadelphia—
Report of the Stockholders of the Dauphin and Susquehanna Coal Company, 1848.

From Thomas U. Walter, Esq., Philadelphia—
Final Report of the Building Committee of the Girard College for Orphans, to the Councils of the City of Philadelphia, also a Report to the Building Committee, by T. U. Walter, Architect.

From James S. Lippincott, Esq., Philadelphia—
The Antiquities of Rome, to which are prefixed two Essays concerning the Roman Learning, and the Roman Education, by David Kennett.
The Teacher: or Moral Influences employed in the Instruction and Government of the Young, by Jacob Abbott.
The District School: or National Education, by J. Orville Taylor.

From Charles E. Smith, Esq.—
New York Legislative Documents, viz:
No. 102, Annual Report of the Secretary of State, relative to Railroad Statistics, March 4th, 1847.
No. 132, Annual Report from the same, on the same subject, March 7th, 1848.

From John Merrick, Esq., Hallowell, Maine—
Specimen of Iron Ore, from Dover, Maine.

The reports from the Officers and Standing Committees were received.

On motion, it was—

Resolved, That the Committee on Exhibitions be, and they are hereby instructed to take the necessary steps to hold an Exhibition of American Manufactures, next Fall, agreeably to their recommendation this evening.

On the report of the Special Committee, appointed at the last meeting, the following resolutions were unanimously adopted, viz:

Resolved, That the members of the Franklin Institute have heard with the most profound sorrow, that Dr. Thomas P. Jones, one of the earliest of their associates, departed this life on the Eleventh day of March last, after a long career of usefulness in the walks of mechanical science.

Resolved, That the services of Dr. Jones, as the founder and able editor of the Journal of the Institute, from the time the publication of it was commenced until his death, and also for several years as the Professor of Natural Philosophy and Mechanics in the Institution, will ever be gratefully remembered by all who have participated in the labors and advantages of our society.

Resolved, That we sincerely condole with the family of Dr. Jones, in their recent and irreparable bereavement, and that a copy of these resolutions be transmitted to them by the corresponding secretary.

Communications on subjects connected with science and the arts, being called for;

Mr. A. W. Whitney exhibited his patent Improved Wiring Machine, a description of which will be found at page 384 of the present number of the Journal.

Mr. Williams submitted to the inspection of the members two Foot-warmers, which present a singular phenomenon. They consist of boxes of polished zinc for the purpose of containing hot water, and are covered with cloth embossed in different colors, lined with calico. The pattern embossed upon the cloth has imprinted itself upon the zinc, the metal being tarnished under the black, and having remained bright under the other colors.

Mr. Cardeza exhibited a rifle constructed to load at the breech, and made from his drawings in 1846. The gun was familiar to some of the gentlemen present, having been used in that year, in experiments upon the explosive force of gun-cotton. His reason for exhibiting it was, that a patent for the same thing had recently been taken out by a resident of New York.

Mr. Smith exhibited a solution of gun-cotton in ether, and explained the advantages which it has as a dressing for wounds. He stated that a careful microscopic examination of it, showed no fibrous structure, and gave no traces of the polarization of light, as had been affirmed.

Dr. Rand presented to the meeting, a patient who had been operated on for a cyst on the right elbow—the wound having been dressed with the ethereal tincture of gun-cotton. It had succeeded admirably —and allowed such free action of the joint during the healing, that the individual had been able to pursue his trade, that of a weaver.

Prof. W. R. Johnson stated that gutta percha dissolved in chloroform, and gave a very similar substance by evaporation, which in addition to the advantages possessed by the tincture of gun-cotton, was more elastic, and therefore permitted of still freer motion without injury to the dressing.

Mr. Plotts explained the theory of his method of rational arithmetic, by means of which children could be taught so as to understand and explain every step which they are obliged to take in solv-